DOCUMENT RESUME

ED 055 238 VT 014 081

AUTHOR Kapes, Jerome T.

TITLE The Relationship Between Selected Characteristics of Ninth Grade Boys and Curriculum Selection and Success in Tenth Grade.

INSTITUTION Pennsylvania State Univ., University Park. Dept. of Vocational Education.

SPONS AGENCY Pennsylvania State Dept. of Education, Harrisburg. Bureau of Vocational, Technical, and Continuing Education.

PUB DATE Aug 71

NOTE 149p.

EDRS PRICE MF-$0.65 HC-$6.58

DESCRIPTORS Academic Aspiration; Comparative Analysis; Correlation; Family Background; Grade 9; *Grades (Scholastic); *High School Curriculum; *High School Students; *Individual Characteristics; Longitudinal Studies; Occupational Aspiration; *Success Factors; Vocational Development; Vocational Education

ABSTRACT

This second report on a 10-year longitudinal study of Pennsylvania youth identifies selected individual characteristics which are predictive of choice between academic and vocational curriculums and academic success after Grade 10. Using data on all male Altoona public school students who were in Grade 9 in 1968-1969, the study analyzed the effects of variables measuring ability, occupational values, vocational maturity, family background, and occupational aspirations. The results show that success in the academic curriculum is much more predictable than success in the vocational curriculum, with 51 percent of the variance explained by five variables in the former compared with only 27 percent by all the variables in the latter. Curriculum choice was found to be even less predictable, with only 22 percent of the variance explained by the 12 variables. Further research with two other samples will be used to validate the results. A related document is available as VT 014 080 in this issue. (BH)

THE PENNSYLVANIA STATE UNIVERSITY
DEPARTMENT OF VOCATIONAL EDUCATION

THE RELATIONSHIP BETWEEN SELECTED CHARACTERISTICS OF NINTH GRADE BOYS AND CURRICULUM SELECTION AND SUCCESS IN TENTH GRADE

ED055238

JEROME T. KAPES

Pennsylvania Department of Education
Bureau of Vocational, Technical and Continuing Education

(Project No. 19-1013)

VOCATIONAL — TECHNICAL EDUCATION **Research Report**

VOCATIONAL DEVELOPMENT STUDY SERIES

VDS MONOGRAPH, NUMBER 2

AUGUST, 1971

ED055238

U.S. DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
OFFICE OF EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY.

The Relationship Between Selected Characteristics of Ninth Grade Boys and Curriculum Selection and Success in Tenth Grade

Jerome T. Kapes

The Pennsylvania State University
University Park, Pennsylvania

August, 1971

Pennsylvania Department of Education
Bureau of Vocational, Technical and Continuing Education
(Project No. 19-1013)

PREFACE

This monograph is the second in a series of such publications emanating from the Vocational Development Study (VDS), a ten-year longitudinal investigation currently being undertaken in the Department of Vocational Education at The Pennsylvania State University. Within the broad program of research focused upon uncovering the effects of the senior high school experience upon the development of youth, the study reported herein contributes some significant initial evidence.

In identifying selected characteristics of a sample of Altoona, Pennsylvania ninth grade boys which are predictive of their curriculum choice (academic versus vocational-technical) and their success in that curriculum at the conclusion of tenth grade, Kapes has generated a number of potentially useful results. Based upon the results of two future replications of this study with independent samples of similar youth planned in Hazleton and Williamsport, Pennsylvania the validity of such applications will be revealed.

As an extension and refinement of the Cooley and Lohnes Career Development Tree construct, this investigation has some immediate theoretical implications in addition to its potential for practical applications in secondary schools.

Of both theoretical and practical importance, this monograph is viewed as a truly significant first step in the Vocational Development Study's progress toward creating an effective impact upon the practice and theory upon which vocational education is based.

Joseph T. Impellitteri, Professor and
Chairman
Graduate Studies and Research
Department of Vocational Education

TABLE OF CONTENTS

	Page
PREFACE	ii
LIST OF TABLES	v
LIST OF FIGURES	vii
Chapter	
I. ORIGIN OF THE STUDY	
Introduction	1
Theories of Vocational Development	2
The Cooley and Lohnes Study	6
Statement of the Problem	14
Definition of Terms	16
II. REVIEW OF RELATED LITERATURE	
Introduction	20
Publications Concerning Career Development Which Relate Specifically to the Theoretical Aspects of this Study	20
Summary	33
Studies in the Areas of Career Development, Psychology or Sociology Which Relate to the Student Characteristics of Interest in the Study	35
Summary	56
Studies or Other Publications in Career Development or in Other Behavioral Sciences Which Relate to the Methodology and Techniques Used in this Study	58
Summary	64
III. PROCEDURE	
Population and Sample	66
Essential Data	68
Independent Variables	68
Dependent Variables	76
Analysis	80
IV. FINDINGS	
Introduction	86
Question #1	92
Question #2	97
Question #3	101
Question #4	105

Chapter | Page

V. SUMMARY, CONCLUSIONS, IMPLICATIONS AND RECOMMENDATIONS

Summary 113
Introduction 113
Statement of the Problem 113
Procedure 114
Findings 116
Conclusions 117
Question #1 117
Question #2 120
Question #3 123
Question #4 126
Implications 129
Super's Theory 129
Cooley and Lohnes 131
Recommendations 132

REFERENCES 134

LIST OF TABLES

Table		Page
1.	The Relationship Between Earned and Weighted Grades . . .	78
2.	Correlations Among the Three Measures of School Success for 264 Tenth Grade Boys	79
3.	Means, Standard Deviations and Median GPA for each Curriculum and for the Total Sample, and the Four Group Breakdown Resulting from Dividing each Curriculum on the Median	84
4.	Means and Standard Deviations for the 16 Independent Variables for the Total Sample and for Each Curriculum . .	87
5.	Xero-order Correlations Among the 16 Independent Variables for the Total Sample (N = 458)	90
6.	Zero-order Correlations Between the 16 Independent Variables and the Dependent Variables Curriculum Choice and GPA	91
7.	Regression Analysis Between the 16 Independent Variables in the Full Model and the Dependent Variable Curriculum Choice (N = 458)	93
8.	Regression Analysis Between the 6 Independent Variables in the Restricted Model and the Dependent Variable Curriculum Choice (N = 458)	96
9.	Regression Analysis Between the 16 Independent Variables in the Full Model and the Dependent Variable GPA for the Vocational Curriculum (N = 250).	99
10.	Regression Analysis Between the 3 Independent Variables in the Restricted Model and the Dependent Variable GPA for the Vocational Curriculum (N = 250)	100
11.	Regression Analysis Between the 16 Independent Variables in the Full Model and the Dependent Variable GPA for the Academic Curriculum (N = 208)	102
12.	Regression Analysis Between the 5 Independent Variables in the Restricted Model and the Dependent Variable GPA for the Academic Curriculum (N = 208)	104

Table | Page

13. Group Means and Overall F Ratio for the 16 Independent Variables Among the 4 Groups: Successful Vocational, Unsuccessful Vocational, Successful Academic, Unsuccessful Academic 107

14. Zero-order Correlations Between the Three Discriminant Functions Generated (Among the 4 Groups) and the 16 Independent Variables (N = 458) 108

15. Percent of Each Group Classified into the 4 Possible Groups and Group Centroids for Each of the Three Discriminant Functions 111

16. A Comparison of the Variables in the 3 MRA Restricted Models and Variable Correlations with the DF 127

LIST OF FIGURES

Figure		Page
1.	Project TALENT: Career Development Tree	8
2.	Percentages of Stable and Changed Career Plans over Four Years for TALENT Ninth Grade Males on Four Category Plans Criterion	12
3.	A Chronological Graphic Representation of the Study	15
4.	Centroids of 4 Groups in Two Discriminant Space	112

I

ORIGIN OF THE STUDY

Introduction

The history of the concept of work can be traced back to a time preceding the birth of Christ. Wrenn (1964) traces the evolution of the concept of work and finds the Greeks and Romans considered work a curse; early Christians found it essential and necessary; Luther felt that work was carrying out God's purpose in one's life; and Calvin saw work as required of man by God. In early American history work is seen not only as a necessity to survival, but was also the basis for dignity and honor as a man. The Protestant ethic which was a dominating force in American life can be characterized as working hard and getting ahead. The nature of work was changed greatly as a result of the industrial revolution with the emergence of many more specific occupations and the movement away from physical labor as the primary component of work. In the early twentieth century man's work activity became the concern of educators as well as the industrialist and the worker. The worker was forming unions to promote his cause and the industrialist was turning to the psychologist for help in dealing with the worker. In 1908 Frank Parsons' book, Choosing a Vocation, which dealt with vocational guidance, was published, and paved the way for an organized vocational guidance movement. In 1917 the first piece of federal legislation concerned with vocational education (the Smith-Hughes Act) was enacted into law. Ten years later Elton Mayo of

Harvard University began a series of studies on industrial behavior at the Hawthorne plant of the Western Electric Company. From their beginnings early in the century until after World War II the fields of vocational guidance, vocational education and industrial psychology grew into fairly well defined areas of study, each somewhat interrelated and all borrowing from a number of other disciplines. Within this environment a psychology of occupations grew up based mostly on a trait and factor approach to personality measurement. It was in this setting that Eli Ginzberg and his associates (1951) launched a major effort to bring together under some general theory the study of the vocational development process.

Theories of Vocational Development

Cooley and Lohnes (1968) describe the recent development of vocational psychology in the following manner:

> Vocational psychology has enjoyed a remarkable surge since 1950, and this wave of progress is due in part to a new emphasis on career patterns as a criterion, in opposition to occupational placement. A career pattern is the sequence of vocationally relevant decisions made by a person over a major part of his life history, as it is extracted and classified by the scientist studying it (Cooley and Lohnes, p. 4-1).

This surge of which Cooley and Lohnes speak was due to a great extent to the work of Ginzberg, Ginsburg, Axelrad and Herma (1951) whose book Occupational Choice: An Approach to a General Theory both proposed the need for a theory and provided the rudiments for theory building. Ginzberg (1952) stated:

> After a comprehensive study of the literature of vocational guidance, my colleagues and I came to the conclusion that the movement was severely handicapped because both investigators and

> practitioners were working without the help of any theory at all or with severely limited theories (Genzberg, p. 492).

The three basic elements of Ginzberg's theory were: 1) "occupational choice is a developmental process;" 2) "the process is largely irreversible;" and 3) "the process ends in a compromise." A second significant contribution of the Ginzberg work was that aspect dealing with the use of stages or decision points in the developmental process.

At the same time that Ginzberg and his associates at Columbia University were proposing their framework, Super began his now famous Career Patterns Study (CPS). Super (1953) commented on the Ginzberg work and expanded on the basic theoretical elements which Ginzberg had proposed. In the same article Super proposed his own theory which was based on ten propositions. Since that time, and as a result of the CPS Super has published numerous works which have contributed significantly to the study of career development. Super, et al. (1957) put together a report on the CPS which provided an expanded theoretical position for the study. Its major emphasis was on stages and substages of vocational development. Although Super's stages resembled those of Ginzberg's, major credit was given to Buehler (1933) for her initial work on life stages. Other differences between Super and Ginzberg include Super's emphasis on the entire process of career as opposed to the more narrow concept of occupational choice, and the elevation of the constructs of <u>self-concept</u> and <u>vocational maturity</u> to a place of prominence in vocational development theory.

Super and Overstreet (1960) reported the findings of a study which examined the vocational maturity of ninth grade boys based on

CPS data. Super (1963) and others devoted a monograph to self-concept theory and its relationship to vocational development. Many other studies of the vocational development process have been published by Super, his colleagues, and graduate students, all aimed at providing pieces of an overall theory. Super's approach has been one of developing theory through empirical research rather than testing a theory which had been previously defined. His major contributions have been the creation of a framework in which to study career development and the application of trait and factor methodology within a developmental model.

Although Super's work in theory building has been highly influential, there have been other significant theories of vocational development proposed and tested in recent years. Two of the best known are those of Roe and Holland. Roe (1956) proposed a theory for explaining vocational choice which was based primarily upon the influences of early childhood experiences. Roe's studies focused on the origin of interest, and her theory proposed the development of early interests which were oriented either "toward persons" or "not towards persons." On the basis of this interest orientation, a person's membership in one of eight occupational groups could be predicted. In addition to the occupational fields concept, Roe also proposed a second dimension--level of occupation--which completes the 48-cells two-way taxonomy of occupations for which she is probably best known. Roe and Siegelman (1964) have reported studies attempting to validate her theory, the results of which have provided more negative rather than supportive evidence.

Holland (1959) foresaw a need for additional theorizing in the area of vocational choice and proposed a theory based on personality types. Holland's contention was that "the person making a vocational choice in a sense 'searches' for situations which satisy his hierarchy of adjustive orientations." Holland's theoretical framework depicted six occupational environments and six personal orientations to match those environments. The vocational choice process is, in these terms, one of finding the occupational environment for one's dominant personal orientation. Also included in Holland's original framework was the concept of level of choice within each environment. More recent writings by Holland, however, have had little to say about this aspect of his theory. Holland (1966) authored a monograph which presented an up-to-date version of this theory along with suggestions for research on the theory. Research using Holland's theory has been more widespread and somewhat more successful than research with Roe's theory, but both theories have been researched mostly with college-bound students. Ashby, et al. (1966), Osipow, et al. (1966) and Wall, et al. (1967), have reported three such studies which partially substantiate Holland's theory with college students.

Osipow (1968) has devoted an entire book to the examination of current theories of career development. In addition to the theories described on the preceding pages several other approaches to explaining vocational behavior were also reviewed by Osipow. Using a number of criteria for judging the adequacy of a theory Osipow comes to the conclusion that:

> For formal adequacy as theories, much seems to be lacking. In general, the theories have failed to pay serious attention to the satisfaction of the criteria applied to the scientific evaluation of theory (Osipow, p. 232).

Of all the theories reviewed it appears that Super's theory is the least inadequate. Osipow concludes that:

> As a conceptual model, Super's theory seems to be the most highly developed and advanced. This is reflected in its explicitness, its fairly high degree of empirical support, and its substantially larger number of applications to human affairs (Osipow, p. 233).

Over the past 20 years, theory-building and research in the area of career development has increased tremendously, but as Osipow has pointed out, much is still lacking. Among the theories now available, Super's appears to have been the most adequate and the most researched. One of the necessary features of a theory in addition to its usefulness in explaining a phenomena is its ability to generate research on that phenomena. In addition to the research which Super and his colleagues have undertaken as a result of his initial theorizing, Cooley and Lohnes (1968) using Project Talent data have conducted some most significant research as an extension of Super's notions. It is the Cooley and Lohnes' extension of Super's theory as reported in Project TALENT: Predicting Development of Young Adults which is the focus of this study.

The Cooley and Lohnes Study

Cooley and Lohnes (1968) have undertaken an empirical study of the career development of males using a trait and factor measurement methodology with a developmental model as recommended by Super. The research has been confined to males because as Cooley and Lohnes have

stated, "We subscribe to the suggestion of Roe and of Super that the career process for women needs to be conceptualized differently than that for men" (Cooley and Lohnes, p. 4-42). By using a large battery of measures refined into factors from a previous study [Measuring Adolescent Personality (MAP), Lohnes, 1966]. The authors used discriminant function analysis to classify their large sample into various group memberships. Group membership was obtained by a dichotomous classification at four crucial stages of development. The results of their research yielded a proposed career development tree with twelve terminal points. The following insert (Figure 1) is a copy of the Project Talent Career Development Tree.

The first branch in the career development tree is a basic people versus things orientation, similar to that suggested by Roe, which takes place preceding the junior high school years. Because they were not able to collect this orientation information on their sample earlier than ninth grade, Cooley and Lohnes used ninth grade occupational aspirations for this dichotomy. The second branch in the tree takes place at the end of ninth grade when students are required to make the choice of college or non-college curriculums in high school. This second decision point of the career tree is that which Super and Overstreet (1960) have studied, and which is of primary interest in this study.

In the Vocational Maturity of Ninth Grade Boys, Super and Overstreet (1960) attempted to answer a number of questions concerning the readiness of ninth grade boys to choose among several different curricula. "Are their aptitudes, interest, and personality traits

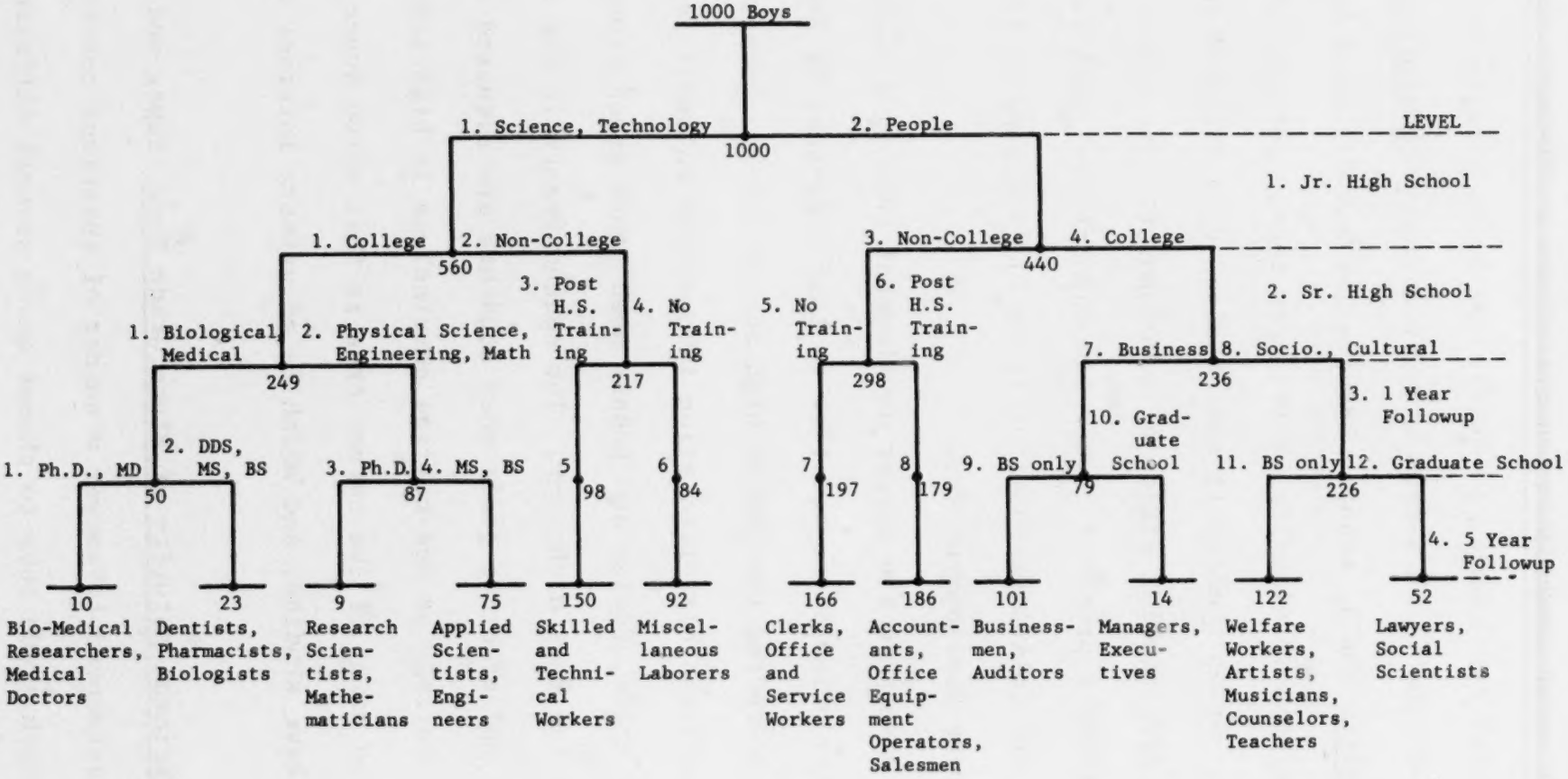

Figure 1. Project TALENT Career Development Tree

Note: From Project TALENT: Predicting Development of Young Adults, William W. Cooley and Paul R. Lohnes, 1968, Figure 4.1A, p. 4-57.

sufficiently developed? Are their vocational aspirations sufficiently stable? Do they know the world of work and of education sufficiently well?" (Super and Overstreet, p. vii) Although much of the monograph dealt with the development of the vocational maturity construct the authors did report conclusions relevant to the readiness question.

> . . . the data of this study suggest that a substantial number of boys are not yet ready, in the ninth grade, to decide on direction of endeavor, or, specifically, on a future occupation. This early adolescent stage is one, not of making and implementing a vocational choice, but rather of developing planfulness, of preparing to make a series of educational and occupational decisions (Super and Overstreet, p. 152).

The authors further stated:

> But the lack of relationship between consistency of vocational preferences, wisdom of preferences, and other measures, together with the number of boys whose choices are unwise, judging by their aptitudes, interests, or socioeconomic resources, suggest that the typical ninth-grader does not understand himself and his potentialities as well as he should in order to choose between levels, and still less among fields of endeavor as reflected in the curricular alternatives open to him (Super and Overstreet, p. 153).

Although these studies provided evidence to question the advisability of allowing youth to prepare for specific occupations in high school, the majority of our current school systems do require some very specific educational decisions concerning preparation for a career. If we consider the two curricular choices most often available to boys (vocational or academic), we find some very specific choices required. While the academic boy may have considerable flexibility, the boy who chooses the vocational curriculum usually must select a particular occupational training program, or one for a cluster of occupations. Although the students in the two curriculums may differ considerably in their occupational choices, their biggest differences

are probably in the type of high school experiences they have chosen and will receive. One student has chosen an experience which is very specific, tangible and leading immediately to employment after high school, and the other has chosen an educational path leading to more educational preparation and resulting in the formulation of quite nebulous and distant goals.

While it may be helpful to know, or suppose, that ninth graders are not ready to make specific occupational and educational choices, the reality of the situation often requires that they do so. Students in schools across the country make this choice, whether it is done advisedly, or not. Although such a decision is not irreversible, these educational paths gradually lead in significantly different directions. Upon what basis, then, do students make such an important choice of educational paths?

What student characteristics are predictive of the choice between the occupationally specific vocational curriculum and the occupationally broad academic curriculum? If Super is correct, are those boys who choose the vocational curriculum more prepared and capable of specific choices than those who choose the more flexible and less specific academic curriculum? How much of this choice is due to intelligence or other specific abilities? Is the choice a function of values or interests and if interests are specific enough, will a student choose a vocational curriculum? How much of the decision is influenced by the environment, the home and family? It is probably true that all of these factors are somewhat important, but their exact relationship is difficult to predict.

Although Super reaches the conclusion that many of our ninth grade students are not ready for the occupational and curricular choices which many of our school systems require, Cooley and Lohnes insist that this choice point is a good place to dichotomize career paths. According to the Cooley and Lohnes career development tree, the next choice task is at the end of high school. Although many things happen to a student between ninth grade and the end of high school which may change him and his subsequent choices, the Cooley and Lohnes career tree does not account or allow for these influences. Moreover, even though the student's ninth grade choice may have been inappropriate in Super's sense, all shifts to the other alternative are termed "path-jumping," "migrating," or "unstable" in terms of Cooley and Lohnes. They state that "Table 4.7 (presented as Figure 2 in this paper) indicates considerable stability for the four-category plans criterion over four years from ninth grade to one year out" (Cooley and Lohnes, p. 4-48). An examination of Figure 2 appears to show at least as much instability as stability.

Whether one views Figure 2 as demonstrating stability or instability in terms of the Cooley and Lohnes model it can be said that simply dichotomizing on curriculum choice at ninth grade and not attending to the ramifications of that decision results in the omission of a large portion of the student's experience. Students are not just members of one educational group or another as a result of their initial decision, any more than workers on the job are simply classed by their job title.

Ninth Grade Plans		Follow-up Plans (1964) CS	NCT	NCNT	CNS	Plan N (1960)
CS	(College Science)	35	13	16	36	4,534
NCT	(Noncollege Technical)	12	37	33	18	3,302
NCNT	(Noncollege Nontechnical)	4	29	46	21	2,133
CNS	(College Nonscience)	16	9	28	47	1,952
						11,821

Figure 2. Percentages of Stable and Changed Career Plans over Four Years for TALENT Ninth-Grade Males on Four-Category Plans Criterion

Note: From Project TALENT: Predicting Development of Young Adults, William W. Cooley and Paul R. Lohnes, 1968, Table 4.7, p. 4-50.

Studies in industrial psychology have provided us with at least two useful measures by which a worker can be characterized. These measures as applied in the Minnesota Studies in Vocational Rehabilitation, Weiss, et al. (1969) are referred to as job "satisfaction" and "satisfactoriness." Since satisfactoriness and satisfaction are the criteria used to evaluate the worker on the job and are indicative of vocational adjustment, should not these same criteria be applied to those preparing for the world of work? By adding either or both of these constructs to the Cooley and Lohnes model each of the high school groups could be studied while they were undergoing the high school experience. These constructs could possibly account for much of the unstable or path-jumping behavior. Furthermore, ninth grade characteristics found to be related to these constructs should shed additional light on the vocational development process.

In summary, this chapter has dealt with the evolution of theories of the vocational development process. Informal theories concerning why people work have existed since before the time of Christ, but it was only in recent years that theories concerning the choice of one's occupational activities throughout life have received formal attention. Beginning with the work of Ginzberg, a number of formal theories of vocational development have emerged and it appears that the most productive of these theories is that proposed by Super. Aspects of Super's theory have been applied and extended by a number of other researchers, and the application of interest in this study is that proposed by Cooley and Lohnes in their "Career Development Tree."

Within the basic framework of Super's theory this study will attempt to apply and extend the work of Cooley and Lohnes.

Statement of the Problem

This study is partly a replication of the Cooley and Lohnes study to the extent that it uses an alternate set of personality trait measures (as suggested by Cooley and Lohnes, p. 5-6) to predict a dichotomous variable similar to the college versus non-college curriculum used in their study. The dichotomous variable used in this study to represent the ninth grade decision point is entry into a vocational versus an academic curriculum. This criterion differs only slightly from that used by Cooley and Lohnes in that the specific vocational curriculum is used instead of the less specific non-college curriculums.

This study is an extension of the Cooley and Lohnes work in that it attends to the degree of belongingness to the chosen group in the sense of being a successful or unsuccessful member of that group. While belongingness could be studied using either the success (satisfactoriness) or satisfaction criterion discussed previously, the success criterion was selected on the basis that: (1) it is more likely to precede satisfaction; and (2) is more readily obtained. By longitudinally examining the process starting with the initial decision of students to join one of two high school curriculum groups and following up with a measure of their success as a member of that group it is possible to compare four high school groups. A graphic representation of this study is presented in Figure 3.

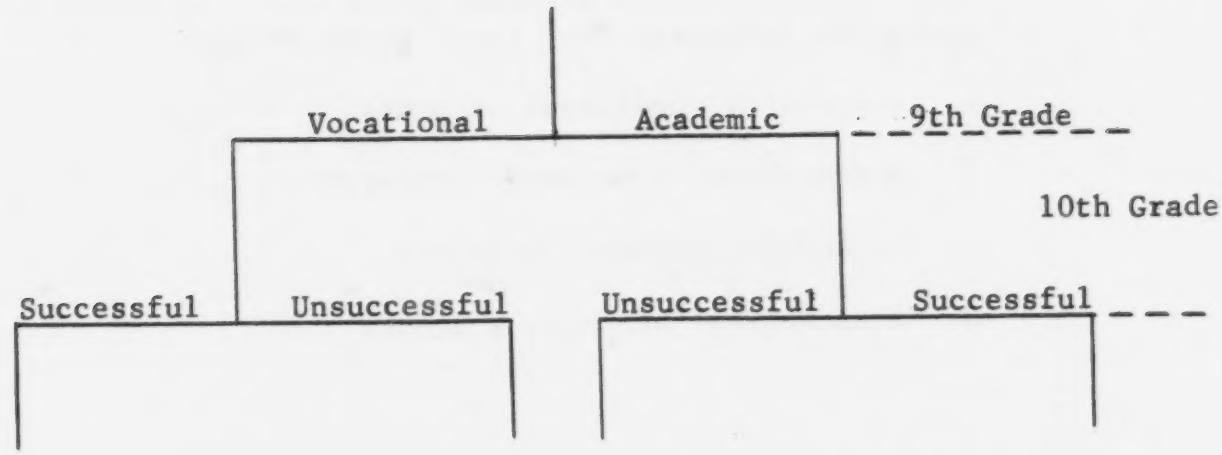

Figure 3. A Chronological Graphic Representation of the Study

The purpose of this study is to explore in general the following two questions:

1. What characteristics of ninth graders are predictive of high school curriculum selection?

2. What characteristics of ninth graders are predictive of success in the high school curriculum selected?

Within the limitations of this study, answers to the following specific questions were sought:

1. What characteristics of ninth grade males are predictive of tenth trade enrollment in a vocational versus an academic curriculum?

2. What characteristics of ninth grade males who have enrolled in the vocational curriculum in tenth grade are predictive of success in tenth grade as measured by grade point average (GPA)?

3. What characteristics of ninth grade males who have enrolled in the academic curriculum in tenth grade are predictive of success in tenth grade as measured by grade point average (GPA)?

4. What characteristics of ninth grade males differentiate among the following four tenth grade groups?

   a. successful vocational students

   b. unsuccessful vocational students

   c. successful academic students

   d. unsuccessful academic students

Definition of Terms

In order to provide a clarification of some of the terms used in this study the following definitions are included here.

Academic Curriculum: is defined as the particular systematic arrangement of courses and activities designed for that group of high school students who are preparing for college regardless of whether or not all members of that group actually expect to attend college.

Aptitudes: "Specific capacities and abilities required of an individual in order to learn or perform adequately a task or job duty" (Dictionary of Occupational Titles, 1965). This definition implies that each individual possesses multiple aptitudes.

Career: "Refers to the total pattern of jobs held during a worker's lifetime" (Baer and Roeber, 1964). Also, "the developmental process by which a person learns about the world of work; acquires work related values, skills, and habits; develops specific occupational interests and intentions; prepares for and seeks an entry occupation; and creates for himself a long term work history involving a sequence of positions and altered responsibilities, terminating in retirement or death" (Cooley and Lohnes, 1968).

Career Pattern: "The sequence of changes in occupational level or field made by an individual during his working life" (Super, 1957). Also, "the sequence of vocationally relevant decisions made by a person over a major part of his life history, as it is extracted and classified by the scientist studying it" (Cooley and Lohnes, 1968).

Educational Level: is defined as the amount of formal schooling an individual has completed.

Occupation: "Whatever an adult spends most of his time doing" (Roe, 1956). Also, "a group of similar jobs found in several establishments" (Shartle, 1959).

Occupational Level: "This classification is based upon degrees of responsibility, capacity, and skill. It should be noted that these are not exactly correlated. Whenever there are marked differences, level of responsibility is considered primary" (Roe, 1956). Also, "for most purposes, then, it is possible to think in terms of one vertical dimension along which occupations may be placed. This dimension is vertical in that occupations require more or less of this characteristic and can be ranked above or below each other on this dimension. This composite dimension may therefore be characterized as one of level" (Super, 1957).

Occupational Values: Also referred to as Work Values, they are defined as "A set of concepts which mediate between the person's affective orientation and classes of external objects offering similar satisfactions" (Zytowski, 1970). Also, "values may be regarded as characteristic outer expressions and culturally influenced manifestations of needs" (Katz, 1963).

Success in High School: (Satisfactoriness) is defined as the grade point average (GPA) which a student receives as a result of applying a weighted formula. The higher the GPA, the more successful the student.

Vocational Curriculum: is defined as the particular systematic arrangement of courses and activities designed to prepare students for immediate employment after high school in the particular occupations taught regardless of whether or not the students enrolled in each occupational area actually expect to work at that particular occupation after high school. Specifically, for the purpose of this study the vocational curriculum includes the following shop program: Auto Body, Auto Mechanics, Building Maintenance, Carpentry, Computer Technology, Drafting and Design Technology, Electricity, Electronics Technology, Engineering Related Technology, Home Appliance Repair, Machine Shop, Plumbing, Planing Mill, Printing, Sheetmetal, Trowel Trades and Welding.

Vocational Development: ". . . an ongoing, continuous, generally irreversible, orderly, patterned, and dynamic process, which involves interaction between the individual's behavior repertoire and the demands made by society, that is, by the developmental tasks. Vocational development is essentially a process of compromise or synthesis" (Super, 1957). Also, career development: "those aspects of the continuous unbroken flow of a person's experience that are relevant to his fashioning of an identity at work " (Tiedeman and O'Hara, 1963). These two terms will be used interchangeably in this study.

Vocational Maturity: "Refers to the maturity of an individual's vocational behavior as indicated by the similarity between his behavior and that of the oldest individuals in his vocational life stage" (Crites, 1961). Also, Super defines two measures of vocational maturity: "Vocational Maturity I focuses on life stages and is indicated by the actual life stage of an individual in relation to his expected life stage (based on his chronological age). Vocational Maturity II focuses on developmental tasks and is represented by the behavior of the individual in handling the developmental tasks with which he actually is coping (Super, 1957).

II

REVIEW OF RELATED LITERATURE

Introduction

In order to identify other research studies or published materials which contain relevant information for this study a review of the literature was conducted. The literature reviewed was grouped into the following three categories:

1. Publications concerning career development which relate specifically to the theoretical aspects of this study.
2. Studies in the areas of career development, psychology or sociology which relate to the student characteristics of interest in this study.
3. Studies or other publications in career development or in other behavioral sciences which relate to the methodology and techniques used in this study.

The materials reviewed under each of these three categories include sources from books, periodicals, journals, dissertations and unpublished papers. In some cases a publication may be reviewed in more than one category if it contains information relevant to several categories. Also, only those portions of a publication which are relevant to the particular category of information being considered are reviewed.

Publications Concerning Career Development Which Relate Specifically to the Theoretical Aspects of this Study

The major theoretical framework in which this study was conducted has been drawn mainly from the works of Super, Tiedeman, and

the combined efforts of Cooley and Lohnes. Of the three approaches, Super's theory appeared first in the literature, is the most widely researched and provides the broadest base from which to draw upon. The early stages of this theory were first suggested by Super (1953) as a beginning framework in which to conduct his Career Pattern Study (CPS). Super's approach to theory building at that time was to synthesize previous works relevant to a developmental theory. Primary stimulus for his theory appears to have come from Ginzberg et al. (1951), whose publication suggested a theory of occupational choice based on stages. The three basic elements of Ginzberg's theory were that: "occupational choice is a process; the process is largely irreversible; compromise is an essential aspect of every choice" (Ginzberg, et al., p. 186). The three stages of Ginzberg's theory were fantasy (before age 11); tentative (between 11 and 17); and realistic (between 17 and young adulthood).

In addition to Ginzberg, Super acknowledges and draws upon many previous works. Some of the more significant works are briefly reviewed here because of the background and support they provide for Super's theory. Buehler (1933) conducted studies of the life histories of well-known persons. From these studies, Buehler tabulated the types of problems arising at each age and then suggested that the adjustments required at various ages could be classified into life stages. Buehler's life stages consisted of growth, exploration, establishment, maintenance, and decline.

In the field of sociology, Miller and Form (1951) published a major work in which they described five periods of the lifework pattern.

These periods consist of preparatory, initial, trial, stable, and retirement. They further focused on the stability of career patterns which they classified into one of four categories--stable, conventional, unstable and multiple trial. On the stability dimension, Miller and Form report that professional workers were the most stable and unskilled workers the least stable.

Havighurst (1950), (1953) proposed the concept of developmental tasks which provided not only a framework for stages of development, but also expected behavior for each stage. Havighurst defined a developmental task as:

> a task which arises at or about a certain period in the life of the individual, successful achievement of which leads to happiness and success with later tasks, while failure leads to unhappiness in the individual, disapproval by society and difficulty with later tasks (Havighurst, 1953, p. 2).

One of the developmental tasks required of the adolescent period, according to Havighurst, is that of selecting and preparing for an occupation.

Based upon the previous research and theory proposed by the authors reviewed above in addition to others, Super (1953) proposed ten propositions constituting his theory at that time. The ten propositions briefly summarized (not directly quoted) are as follows:

1. People differ in their abilities, interests, and personalities.
2. Each person qualifies for a number of occupations.
3. Each occupation can accommodate a variety of people.
4. Choice and adjustment are continuous processes.
5. The process can be described by life stages.

6. A career pattern is determined by an individual's socio-economic background, ability, personality and opportunities.

7. Vocational development can be aided by maturation, reality testing and self-concept development.

8. The process of vocational development is essentially that of developing and implementing a self-concept.

9. The vocational development process is based on compromise through role playing.

10. Work and life satisfaction depends on the congruency between the individual and his circumstances.

Super and his colleagues began the CPS in 1951 using the ten propositions listed above as an initial framework. After much field work and seminar discussions among the CPS staff, Super, et al., (1957) published a revised version of their theory as the first monograph of the CPS. This volume, although somewhat dated at this time, still is referred to as the primary source of what can be called Super's theory. Numerous publications appearing since 1957 have served to either strengthen, further refine or revise the basic theory based on research results of the CPS. Because of the significance of this work, a fairly detailed summary of those sections spelling out Super's theory will be included here.

The vocational life stages as proposed by Super and based on much of the literature reviewed previously are described here.

1. Growth Stage (Birth--14 yrs.)--The self-concept is developing, and needs, fantasy, interests and capacity are important. The substages of this stage are Fantasy (4-10 yrs.)--needs are dominant and role playing in fantasy is important; Interest (11-12 yrs.)--likes determine aspirations and activities; Capacity (13-14 yrs.)--abilities are given more weight and job requirements are considered.

2. Exploration Stage (Age 15-24)--Self-examination, role try-out, and occupational explorations take place in school,

leisure activities and part time work. The substages of this stage are Tentative (14-17 yrs.)--needs, interests, capacities, values, and opportunities are all considered. Tentative choices are made and tried out in fantasy, discussion, school courses, work, etc.; Transition (18-21 yrs.) --reality considerations are given more weight; Trial (22-24 yrs.)--an appropriate work field is located and tried.

3. Establishment Stage (age 25-44)--Individual seeks a permanent place in chosen field. The substages are Trial (25-30 yrs.)--several changes may be made; Stabilization (31-44 yrs.)--a career pattern becomes clear.

4. Maintenance Stage (age 45-64)--Individual continues and consolidates along established lines.

5. Decline Stages (age 65 on)--Individual gradually withdraws. Substages are Deceleration (65-70 yrs.)--reduction in occupational activity if not complete cessation; Retirement (71 on)--complete cessation of occupational endeavors.

Of these five stages, the growth and exploration stages have been described in greater detail because of their specific relevance for this study. In addition to stages of vocational development, Super also described the process involved as ongoing, continuous, generally irreversible, orderly, patterned and dynamic. He also described some of the vocational developmental tasks appropriate to various stages of vocational development. He pointed out that until adolescence, most tasks are only indirectly related to future work. Beginning with entry into high school, tasks become more directly related to vocations. Examples of vocational developmental tasks related to Super's first two vocational life stages include:

1. Performance of chores around the house.
2. Further development of abilities and talents.
3. Choice of high school or work.
4. Choice of high school curriculum.

5. Development of independence.

6. Choice of college or work.

7. Choice of college curriculum.

8. Choice of suitable job (Super, 1967, p. 44).

Super further delineated the necessity of understanding ongoing vocational behavior through examination of its possible determinants. Among these determinants he suggested such factors as the development of roles and the self-concept, intelligence, special abilities, interests, values, attitudes, personality, and numerous situational and environmental factors. In order to carry out a study of the vocational development process Super proposed the construct of Vocational Maturity which he presumed to be useful in providing information about the relationship between expected and actual vocational behavior. Super defined at least two types of vocational maturity, one related to the particular stage and the other related to typical behavior within that stage. He further differentiated between vocational maturity and vocational adjustment, the latter being based on the individual's ability for adaptation, adjustment and integration of his vocational behaviors. Vocational adjustment can be defined in terms of the success and satisfaction derived from the vocational behaviors engaged in, and it includes both monetary and prestige rewards accruing from work as well as actual job performance. Super pointed out, however, that vocational maturity promotes vocational adjustment which in turn promotes future vocational maturity.

Expanding on the work of Miller and Form (1951) Super proposed the longitudinal study of vocational behavior over time in order to

discover career patterns. Possible determinants of career patterns include psychological and physical characteristics as well as experiences, family background and other situational and environmental variables. The career pattern focuses more on socioeconomic status and mobility than on success and satisfaction derived from the job.

As a means of bringing together all aspects of his theory, Super proposed the following eleven propositions which are reproduced here in full because of their importance to this study.

1. Vocational development is an ongoing, continuous, and generally irreversible process.

2. Vocational development is an orderly, patterned process and thus predictable.

3. Vocational development is a dynamic process of compromise or synthesis.

4. Self-concepts begin to form prior to adolescence, become clearer in adolescence, and are translated into occupational terms in adolescence.

5. Reality factors (the reality of personal characteristics and the reality of society) play an increasingly important part in occupational choice with increasing age, from early adolescence to adulthood.

6. Identification with a parent or parent substitute is related to the development of adequate roles, their consistent and harmonious interrelationship, and their interpretation in terms of vocational plans and eventualities.

7. The direction and rate of the vertical movement of an individual from one occupational level to another is related to his intelligence, parental socioeconomic level, status needs, values, interests, skill in interpersonal relationships, and the supply and demand conditions in the economy.

8. The occupational field which the individual enters is related to his interests and values, the identifications he makes with parental or substitute role models, the community resources he uses, the level and quality of his educational background, and the occupational structure, trends, and attitudes of his community.

9. Although each occupation requires a characteristic pattern of abilities, interests, and personality traits, the tolerances are wide enough to allow both some variety of individuals in each occupation and some diversity of occupations for each individual.

10. Work satisfactions depend upon the extent to which the individual can find adequate outlets in his job for his abilities, interests, values, and personality traits.

11. The degree of satisfaction the individual attains from his work is related to the degree to which he has been able to implement his self-concept in his work (Super, 1957, pp. 89-96).

As a follow-up to the publication of Super's theory, the CPS second monograph authored by Super and Overstreet (1960) focused on the vocational maturity of ninth grade boys. In introducing the theoretical framework for this study the authors made several statements supporting the need for vocational maturity information at about the ninth grade level because of the vocational decisions required at that time by our school systems. If the vocational maturity construct is valid, the authors pointed out, a measure of the construct should be able to differentiate between students who are or are not ready to make certain decisions, and subsequently predict future success, satisfaction and overall vocational adjustment. Also, in order to discover and properly identify indices of vocational maturity within our culture . . . "more research-derived knowledge of the developmental sequence of vocational behavior and the determinants of vocational behavior is needed" (p. 12). On the bases of correlational and factor analysis, four indices of vocational maturity which are important at the ninth grade level were found. These four were titled concern with choice, acceptance of responsibility for choice and planning, specificity of

information about the preferred occupation, and specificity of planning for the preferred occupation. The data used in this study by Super and Overstreet is based on a cross-sectional sample of 105 boys and the authors go on to point out the need for similar studies of a longitudinal nature. From the results of the study the authors concluded that vocational maturity is a valid construct and that many ninth grade boys do not possess the vocational maturity necessary to choose either the level or field of their future vocational endeavor.

Crites (1961) proposed a model for measuring vocational maturity based on the life stages and developmental tasks proposed by Super, et al. (1957). He described five possible ways to define and measure vocational maturity and after discussing the benefits and shortcomings of each approach he proposes the combining of two approaches. This resulted in a model which both identifies the developmental task and life stage according to one's age and which also determines the degree of vocational maturity according to actual behavior. The result was a definition and measure of vocational maturity which included both degree and rate of vocational development. Crites (1965), (1969) and Crites and Samler (1967) report on the development and use of a measure of vocational maturity and these publications will be reviewed in the next section of this review concerning student characteristics used in this study.

In a symposium on vocational development, Super (1961) shed some additional light on what he believed to be three important problems in vocational development research at that time. The three problems as discussed in his paper were: 1) the need to develop a suitable

methodology for the treatment of career prediction data as contrasted with occupational prediction data; 2) the need to find a suitable definition of the nature of exploratory vocational behavior, and 3) the need to devise a measure of vocational maturity that is comparable over different age groups. Of the problems mentioned, the first was subsequently dealt with by Cooley and Lohnes (1968), the second by Jordaan (1963) and the third by Crites (1965), (1969).

Super, et al. (1963) found the need to further extend vocational development theory in the areas of self concept and exploratory behavior. Super proposed that as the result of exploratory vocational behavior an individual develops both a self-concept and a concept of various occupations. In making an occupational choice an individual is attempting to implement his self-concept and as he progresses through adolescence both his self and occupational concepts become clarified in terms of his interests, values and capacities. Reality testing and role playing are the primary behaviors involved in accomplishing the vocational developmental task of crystallizing, specifying, implementing, stabilizing and consolidating a vocational preference. The task of crystallizing a vocational preference occurs between the ages of 14-18 and is of primary importance in this study. Jordaan (1963) dealt specifically with exploratory behavior and he concluded that:

> Vocational exploratory behavior refers to activities, mental or physical, undertaken with the more or less conscious purpose or hope of eliciting information about oneself or one's environment, or of verifying or arriving at a basis for a conclusion or hypothesis which will aid one in choosing, preparing for, entering, adjusting to, or progressing in, an occupation (Jordaan, p. 59).

By Jordaan's definition and according to Super's theory students at the ninth grade level are engaging primarily in exploratory behavior and are just beginning the task of crystallizing their vocational preferences and clarifying their self-concepts.

Super (1969a) and (1969b) are the most recent writings by Super concerning his theory which were available to the reviewer. They were published back to back in the inaugural issue of the Counseling Psychologist which in itself is an indication of the reputability of Super's theory. In the first paper, Super summarizes much of what has happened in the field since the inception of his theory and the CPS. In conclusion, he stated that his segmented theory includes the differential psychology of occupations, the psychology and sociology of life stages and developmental processes, patterns of career development, vocational maturity, self concept theory, and the phenomenology of decision making. Super labeled his approach as differential-developmental-social-phenomenological psychology.

In his second paper, Super (1969b) discussed how he believes vocational development theory will look in 1988. Super indicated that by that year adequate statistical analyses may be available to implement the career model, and cites Cooley and Lohnes "career tree" as the most promising prediction method now being worked on. Also, he saw operational guidelines for the use of exploratory experiences in the school curriculum and an even better measure of vocational maturity as promises of the future. And lastly, Super viewed self-concept theory as providing the cement needed for an overarching theory of vocational development which will come about by the year 1988.

Super in formulating later revisions of his theory acknowledged the work of Tiedeman especially in the area of the phenomonology of decision making. Tiedeman (1961) proposed a paradigm for the investigation of vocational decision making which is based on research conducted as part of the Harvard Studies in Career Development. The model proposed by Tiedeman was based on seven stages of decision making divided into two periods. The first of these was called the period of Anticipation and was divided into the following four stages:

Exploration → Crystallization → Choice → Specification

The second period is titled Implementation and Adjustment and was divided into the following three stages:

Induction → Transition → Maintenance.

It is important to note that in the process an individual may be at one stage concerning one decision and at another stage for another decision. Also, each educational and occupational decision consists of seven distinct stages. Tiedeman saw the need for research concerning how individuals view the decision process, and what type of work histories individuals have in terms of kinds, sequence and duration of work activities.

Tiedeman and O'Hara (1963) elaborated on the paradigm proposed previously by Tiedeman (1961). Using a number of case histories they built a general model for decision making and applied it to the vocational choice process. The seven stages proposed earlier remained relatively the same, but with several name changes. The main addition to the theory at this time appeared to be its basic grounding in Gestalt psychology, Field theory and Phenomonology by way of describing

the decision making stages in terms of differentiation and integration. The considerable influence of Erickson (1950), (1959) can be seen in the authors' use of the constructs of Psychosocial Stages and Ego Identity. In many ways, the theory proposed by Tiedeman and O'Hara resembles the "stages of vocational development" and "self-concept" aspects of Super's theory although it appears to be both much broader and more difficult to work with. The authors did, however, provide some guidelines for the theory's use in studies of career development by describing various research possibilities in addition to suggesting the type of data needed and relating the data system to previous studies. The selection of both part-time and full-time employment and selection of subjects and curricula in school were some of the vocationally relevant position choices described by the authors. The origin of vocational goals and the valuing process were also suggested for study.

Cooley and Lohnes (1968) described, developed, and tested what they called a career theory. Basing most of their work on Super's theory, but borrowing a little from many other pieces of research, the authors called their model the "basic construct of career psychology" (p. 5-2). The Cooley and Lohnes approach has been to wed the developmental career model to differential trait and factor psychology. The authors stated that:

> The starting point for building a more complex and powerful career prediction model is the research finding that there is a unique and discriminable centroid (profile of means) for each career pattern in a suitable personality measurement space (Cooley and Lohnes, p. 5-3).

The basic approach of the Cooley and Lohnes model is focusing on dichotomous choice points which occur over time in our culture and which taken together form a career path. An individual follows the path which leads to educational and vocational activities which are most congruent with his characteristics. When "path-jumping" occurs it is because an individual is gravitating towards a path more consistant with his characteristics. The model which resulted from the Cooley and Lohnes research yielded a career development tree which depicted the stable paths leading to a twelve category psychometric taxonomy of careers. The dichotomous choice points used in the model were: 1) people vs. things, 2) college vs. non-college intentions, 3) college field or post high school training choice, and 4) graduate school or not if college is selected. While the Cooley and Lohnes model is quite promising [Super (1969b) has called it the most promising career prediction model now being worked on], it also appears that too much path-jumping is evident for the model to be even partly complete. Both Super (1969b) and Cooley and Lohnes suggest further research to refine this type of approach to explaining career development.

Summary

Of the information uncovered in this section of the review of related literature the following appear relevant for this study.

1. Super's theory of career development has evolved considerably since its inception in 1951 and at the present time it appears to be most promising for explaining vocational

behavior (Super, 1953, 1963, 1961, 1969a; Super, et al., 1957, 1960; Tiedeman, et al., 1963; Cooley and Lohnes, 1968).

2. The career model appears to have replaced the occupational model in much of vocational development research (Super, et al., 1957; Super, 1961, 1969a, 1969b; Tiedeman, 1961; Tiedeman, et al., 1963; Colley and Lohnes, 1968).
3. The concept of stages of career development is fairly well accepted among psychologists, sociologists and career development researchers (Buehler, 1933; Havighurst, 1950, 1953; Miller and Form, 1951; Ginzberg, 1951; Erickson, 1950, 1959; Super, et al., 1969a; Tiedeman and O'Hara, 1963; Cooley and Lohnes, 1968).
4. Most career development researchers appear to be in agreement concerning the end of ninth grade as a critical vocational decision point at which to study the constructs and determinants of career development (Super, et al., 1957, 1960; Crites, 1961; Jordaan, 1963; Tiedeman and O'Hara, 1963; Cooley and Lohnes, 1968).
5. Super's theoretical model appears to lend itself well to the type of study of vocational development and career prediction model proposed and explored by Cooley and Lohnes (Cooley and Lohnes, 1968; Super, 1969a, 1969b).

Studies in the Areas of Career Development, Psychology or Sociology which Relate to the Student Characteristics of Interest in the Study

There are sixteen student characteristic variables selected for examination in this study. Studies involving the constructs and measures selected will be reviewed here under the five headings of abilities, occupational values, vocational maturity, family background and occupational aspirations.

Abilities--The instrument selected to assess the multiple abilities possessed by an individual for the purpose of this study is the General Aptitude Test Battery (GATB). With its twelve sub-tests and nine ability measures the GATB is probably the most complete ability measure available anywhere.

The GATB has had a long history of development and research involving the validation of its use for vocational counseling. Many of these studies were specifically designed to investigate its usefulness in predicting success on the job, some to predict academic achievements, and others to predict success in training situations. In order to get a comprehensive look at what has been done in the past, the reader is referred to the General Aptitude Test Battery, Section III: Development, U. S. Department of Labor, October, 1967. Some of the studies or articles cited there are pertinent to this investigation and are briefly reviewed here. Many other references may be found in the "Section III" publication, however, which have not been included in this review.

Dvorak (1956) reported on the GATB in one of a series of articles describing various aspects of multifactor aptitude tests

appearing in the Personnel and Guidance Journal (PGJ). Super, in his comments which followed at the end of Dvorak's article, pointed out what he felt were the weaknesses and strong points of the GATB and offered several suggestions for its further improvement. Since that time much of what Super recommended has been accomplished and more recently Super has stated (Super and Crites, 1962):

> The first edition of this text was both enthusiastic about the promise of this battery and critical of the paucity of data made available in the manuals and in other publications to justify the battery's proposed use. In two revisions of the manuals and in a large number of journal articles, Dvorak and her collaborators have since provided the empirical evidence needed for the evaluation and use of the test battery; in their current form they are a model of completeness and of clarity.

Samuelson (1956) using a sample of 136 males over 16 years of age from the Area Vocational Schools in Salt Lake City, Utah, studied the GATB's use for predicting success of vocational school students in Auto Body, Auto Mechanics, Carpentry, Diesel Mechanics, Electronics and Welding. The criteria used were developed from instructors' ratings of performance in theory class, shop work, and personal characteristics. To establish the reliability of the ratings, students were evaluated at the end of ten weeks and again four weeks later. Reliability of ratings were reported as satisfactorily high. The three criteria, however, were found to be highly intercorrelated and were therefore combined.

It was arbitrarily decided to select a three-aptitude composite to correlate with the criterion for each shop. The basis for their selection was: (1) the aptitudes had no common sub-test; (2) the first two aptitudes selected were those with the highest correlation with

the criterion; and (3) the third aptitude was chosen on the basis of face validity and significant correlation with the criteria. Using this procedure, three aptitudes were selected for all but Auto Body for which only two were reported. Multiple correlations ranged from .508 to .827 within all shop areas, and were significant for all areas except Diesel Mechanics and Welding.

The United States Department of Labor (1967, pp. 244-250) reports the results of studies to investigate the validity and stability of the GATB with high school students. In the validity study, seven different samples of high school students were selected from the entire country and were administered the GATB in some or all of grades nine, ten, eleven and twelve. The studies included a total of 1,939 boys and girls over a period from 1948 to 1958. The criterion with which the nine GATB scores were correlated was either grade point average or final high school rank. Using Fisher Z transformations, the average correlations reported were: Intelligence (G) = .50, Verbal (V) = .53, Numerical (N) = .50, Spatial (S) = .22, Form Perception (P) = .33, Clerical Perception (Q) = .48, Motor Coordination (K) = .32, Finger Dexterity (F) = .19, and Manual Dexterity (M) = .17.

In the stability studies, 663 students were tested in grade nine and again in grade twelve between 1948 and 1951. Only the aptitudes V, S and P showed any significant change in their relationship with the criterion over the three year period. Additional stability studies examining the relationship between aptitude scores gathered

in ninth and twelfth grades yielded correlation coefficients that ranged from .77 to .64 on the average.

Droege (1966) reported the results of a study on maturation to improve the usefulness of the GATB with high school students. The most significant findings were that stability coefficients increased from ninth to eleventh grades. In ninth grade, stability coefficients were highest for General Intelligence (G), .79, Verbal aptitude (V), .79, and Numerical aptitude (N), .77. The lowest stability coefficient was for Finger Dexterity (F), .57. The use of the Occupational Aptitude Patterns (OAP's) with ninth grade students was questioned as a result of the low stability coefficients obtained.

Pickett (1958) reported the results of a study to examine the relationship between GATB scores collected in high school and college grades. His sample consisted of 171 males and females enrolled in engineering, business administration, education and physical education. Initial GATB scores were collected while the students were juniors and seniors in high school and the criterion was college grade point average for the junior and senior years. Significant relationships ($P \leq .05$) were found for approximately 40 percent of the 36 correlations computed, and the aptitudes K, F and M appeared to yield the lowest overall correlations. Different aptitudes appeared to be significantly related to college success in each of the four curriculums studied.

The United States Department of Labor (1967, pp. 276-287) reported the results of follow-up studies of high school performance. The sample included over 20,000 individuals, and several thousand

validity coefficients were computed for grades nine through twelve. The results of the studies indicate that aptitude G yielded the highest overall coefficients for overall high school success, but the other aptitudes also yielded high correlation with certain subject areas. The aptitudes S, K, F and M yielded the lowest coefficients.

Jacobsen (1965) found Numerical Aptitude (N) the best single predictor of overall academic success and of mathematics and social studies grades. The top six predictors in this study in rank order were: N, G, V, Q, K and P.

Ingersoll and Peters (1966) investigated the use of the GATB to predict the grade point averages of freshmen and sophomores in academic and vocational classes in the Ohio secondary schools. The sample consisted of 4,000 ninth and tenth grade boys and girls. Multiple and zero-order correlation analyses were undertaken. Intelligence (G) correlated most highly (.60) with the criterion for the entire sample. The multiple correlation between all GATB predictors and overall grade point average was .64 for the entire sample. The largest beta weights obtained for the ninth and tenth grade samples were with N, V, G and Q. Within specific academic and vocational subject areas each of the nine GATB aptitudes possessed significant weights with some subjects. The only non-academic areas studied were Industrial Arts and Home Economics on the ninth grade level and Industrial Arts, Home Economics, Mechanical Drawing and Art on the tenth grade level. Several business courses were also included. In most cases the GATB significantly predicted the criteria in the above mentioned non-academic courses. The composite of Form Perception (P)

and Verbal aptitude (V) correlated significantly with Mechanical Drawing success (.621). The authors made the observation that few students in the sample studied were taking vocational and commercial courses, and that they found very little literature concerning the use of the GATB in junior-senior high school.

Droege (1965) reported on a study designed to investigate the extent to which occupational test norms validated on an adult sample would predict success of high school students in vocational courses. Norms developed in 1953 for compositors in the printing trade consisting of the aptitudes Intelligence (G), Verbal (V), Clerical Perception (Q), and Manual Dexterity (M) were used. The study was conducted in 1963 by the Indiana State Employment Service, and the sample consisted of 70 ninth grade students. Instructors' ratings one year after entering the program were used as the criterion of success on a dichotomized basis of Good and Poor. The cutting scores were adjusted for maturation on the basis of previous research findings. The multiple correlation between the four aptitude scores based on the 1953 norms and the dichotomized criterion was .38, significant at the .01 level. Droege suggested further research of this nature.

Impellitteri and Kapes (1969); Kapes (1969a, 1969b) reported several studies exploring the use of the GATB with vocational-technical students. On the basis of these studies the authors found aptitude K to yield the highest zero-order correlation (r = .59) with vocational shop grades when using ninth grade GATB scores to predict middle of tenth year grades. The highest multiple correlation obtained between all nine GATB predictors and shop grades was .69 for sample A and .76

for sample B collected one year later. The highest correlations were found with the higher level vocational-technical course areas. Upon cross validation, those aptitudes which appeared most related to mid-year grades in the first sample showed evidence of a large amount of shrinkage when compared to final grades obtained later as well as when computed for the second sample. The most powerful GATB predictors for both samples were aptitudes G, N, S, P, K and M.

Conclusions drawn from the Impellitteri and Kapes studies were that although there may be differences from one sample to another, certain GATB aptitudes do appear to be highly related to success in certain shop areas. Also, although it was not found to be true in some studies reviewed, the GATB aptitudes K, F and M did appear to be significantly related to shop success in these studies.

Pucel, et al. (1971) using a sample of over 1,000 post-secondary students from the project Mini-score data bank found that the GATB paper and pencil parts 1-7 did not differentiate between graduates and dropouts from twelve vocational-technical post-secondary curriculums in Minnesota.

Occupational Values--Zytowski (1970) reviewed the concept of work values and described the work value spectrum as congruent with the interest spectrum but divided into fewer units. He defines work values as ". . . a set of concepts which mediate between the person's affective orientation and classes of external objects offering similar satisfactions" (p. 176). In order to provide a taxonomy of work values Zytowski reviewed the values used by six authors and reached the conclusion that approximately 12 to 15 values categories are fundamental.

Impellitteri and Kapes (1970) after reviewing available work value inventories have pointed out the essential ipsative nature of values and the lack of adequate ipsative work value measures. Beck and Barak (1967) and Katz (1963) have also concurred with the ipsative nature of values. In an ipsative measure, the important question is whether person A values item X more than item Y, rather than whether person A values item X more than person B values item X. In order to fill the need for an ipsative work values instrument which contains valuing statements relevant to students in grades nine through twelve, Impellitteri and Kapes developed an instrument called the Occupational Values Inventory (OVI). The OVI contains the following seven occupational values: Interest and Satisfaction, Advancement, Salary, Prestige, Personal Goal, Preparation and Ability, and Security. Four of the seven OVI scales are used in this study, but all of the scales need to be considered here since each scale represents alternatives chosen when compared with the remaining six competing alternatives.

Kapes (1969c) in an unpublished paper examined the correlations between each of the seven values and the GATB general intelligence (G) score, college aspiration, choice of a vocational curriculum, and sex for 969 ninth grade boys and girls from the same Altoona, Pennsylvania sample used in this study. Significant relationships ($P \leq .05$) were found between each of the independent variables and the three values: Interest and Satisfaction, Salary, and Personal Goal. Advancement was related to sex and curriculum choice, Prestige was related to sex, intelligence and curriculum choice, and Security was related to

intelligence and curriculum choice. Preparation and Ability produced no significant relationships.

Singer and Stefflre (1954) using Centers' Job Values and Desires Checklist found that males with a high level of vocational aspiration valued "Self-Expression" more than those with a low level of aspiration. Also, the values most selected by both groups were "Interesting Experience" and "Self-Expression." Stefflre (1959), using his own instrument, the Vocational Values Inventory (VVI), with high school boys found a significant relationship between college aspiration and "Self-Realization" (r_{bis} = .35) and a negative relationship between college aspiration and "Money." Noncollege aspirants were also more concerned with "Security."

Dipboye and Anderson (1959) using a ranking of nine possible values with ninth and twelfth grade boys and girls found a high degree of similarity between the sexes (rho = .83). Boys gave a higher ranking to "Salary," "Advancement" and "Independence" than did girls. Both sexes ranked "Interesting Work" and "Security" high at both grade levels. From ninth to twelfth grade only small differences were obtained which indicates that little change in work values takes place during the high school years.

Super (1962) administered the Work Values Inventory (WVI) to 88 ninth grade boys of the Career Pattern Study. Based on the results of factor analysis Super concluded that the Intrinsic-Extrinsic dichotomy was not useful with work values. He further concluded that the WVI contained seven clearly identifiable factors of which six appeared to be values.

Kennane and Pable (1962) investigated the relationship between work values and family background using the WVI with 121 eleventh grade white males. Relationships were found between a materialistic atmosphere and the values "Security," "Economic-Material" and "Working Conditions." A cultural family background was found to be related to "Social-Artistic" and "Heuristic-Creative" values. Cohesiveness was related to "Working Conditions" and "Heuristic-Creative" values. The authors concluded that family background is critical in the development of work values.

Gribbons and Lohnes (1965) collected longitudinal data on the work values of 111 boys and girls over a five year period from grades eight through twelve. Twelve work values were categorized, with "Satisfaction" and "Interest" ranking consistently first and second over the five year period. The value rankings were fairly stable over the period from eighth through twelfth grade with the major trend being a shift from idealism to realism. Boys ranked "Salary" and "Prestige" higher than girls, while the girls gave higher rankings to "Personal Contact" and "Social Service."

Sprinthall (1966) examined the relationship between work values and academic achievement for high school boys using Rosenberg's Ideal Job Scale (IJS). The author concluded from the study that achievement groups do not show differential patterns of responses to work values.

Thompson (1966) studied the occupational values of high school students using a modified version of Centers' value scale. A personal information sheet and the values scale were administered to a large group of students while they were in ninth grade and again in tenth

grade one year later. Most students did not change their values over the one year period. Those occupational characteristics valued most were "Interesting Job," "Self-expression," "Security" and "Service to Others." The least important values were "Leadership" and "Authority." Males valued "Leadership," "Salary," and "Recognition" more than females who preferred "Self-expression" and "Service to Others."

Vocational Maturity--The measure selected to assess vocational maturity for the purpose of this study is the attitude scale of the Vocational Development Inventory (VDI). Crites (1965) described the development of the VDI and has provided evidence attesting to its reliability, validity and usefulness in vocational development research. On the basis of studies conducted up to 1965, Crites concluded that verbal vocational behaviors were monotonically related to both age and grade, but more to grade, and that very few differences between males and females and between high and low rent districts were found using the VDI. Crites (1969) more recently reported the results of five years of additional research with the VDI which yielded much new information. Conclusions from these new studies which are relevant here include the following: (1) normative statistics on the VDI vary considerably from one sample to another; (2) within grade differences are smaller than between grade differences; (3) students in the more vocationally-oriented courses score as less mature on the VDI than do their counterparts; (4) students from less favored socio-economic circumstances are less mature as measured by the VDI; (5) parental educational level may be a correlate of vocational maturity; (6) VDI scores are moderately positively correlated with intelligence or

scholastic aptitude; and (7) maturity of vocational attitude is one dimension of a construct of adolescent general adjustment.

Crites and Samler (1967) investigated the relationship between the VDI and adjustment and educational achievement with a longitudinal sample of boys and girls begun in 1957 when the sample was in fifth grade. Seventy percent of this sample was again tested at the beginning and end of twelfth grade. Significant relationships were found between the fifth grade VDI scores and end of twelfth grade scores on the SRA adjustment ratings by teachers (r = .13), CTP-personal adjustment (r = .22), CTP-social adjustment (r = .23), Otis quick-scoring ability test (r = .16), and Warner's Index of Status Characteristics (r = .14).

Gribbons and Lohnes (1968) report the results of studies using their eight Readiness for Vocational Planning scales (RVP) which they have interpreted as vocational maturity measures. When RVP scale scores were compared between eighth and tenth grade, a significant change was observed. They also found that students in the college preparatory group scored consistently higher on the RVP scales than other school curriculum groups. RVP scales scores in eighth and tenth grade were shown to be significantly related to a number of other variables, including the socio-economic level of one's occupational aspirations.

Asbury (1968) used the VDI in assessing the vocational development of a sample of 63 rural Appalachian Kentucky eighth grade boys. Descriptive statistics on his data indicate that his sample scored below average on the OTIS IQ test and on the VDI. The correlation

between the VDI and the Otis IQ was .28. Other relationships uncovered were a correlation of .34 between the VDI and the Stanford Achievement test, and .14 between the VDI and Haller and Miller's Occupational Aspiration Realism scale.

In three studies which compared vocational education and non-vocational education students, the vocational students generally were found to score less mature on the VDI. Bathory (1967) compared ninth grade students enrolled in vocational versus academic curriculums and found that academic students scored significantly higher on the VDI ($P < .01$). Similar comparisons for twelfth graders proved to be non-significant. Bathory also found a significant positive relationship ($P < .01$) between ninth graders' VDI scores and their occupational aspirations. Halloway (1967) used the VDI in comparing 119 cooperative vocational education students with an equal number of non-vocational students. His results supported previous findings that vocational education students score below non-vocational students on vocational maturity as measured by the VDI. Dutt (1968) conducted a large cross-sectional study investigating vocational maturity with over 1,200 eighth and ninth graders in a large school system in Pennsylvania. His findings also concur with previous studies indicating that vocational technical students score lower than academic students on the VDI. He also reported a significant correlation of .42 between intelligence and VDI scores for the ninth grade male group.

Impellitteri and others (1969) examined the relationship between the independent variables intelligence, curriculum choice, college aspiration and sex and the dependent variable vocational

maturity as measured by the VDI. The sample was composed of approximately 970 male and female ninth grade students from a large central Pennsylvania school system. Analysis was undertaken using multiple regression with each partial regression coefficient being tested for its own unique contribution to the explained variance. The results of the study indicated that with the effect of the other variables partialled out, intelligence, college aspiration and sex were statistically significant predictors of the VDI score. Those who were more intelligent, aspired to college, and were females scored higher on the VDI. While curriculum choice (vocational versus non-vocational) may have been related to vocational maturity when simple relationships were examined, the partial regression coefficient for curriculum choice was not significant.

Pucel and others (1970) have undertaken a study to investigate the utility of the VDI for counseling post-high school students and to study the effect that post-high school vocational training has on the vocational maturity of students as measured by the VDI. The sample consisted of 1,000 students drawn randomly from over 6,000 students in the Project Mini-Score data bank. VDI scores were correlated with scores on the GATB, the Minnesota Vocational Interest Inventory (MVII), the Sixteen Personality Factors (16-PF) scales, the Minnesota Importance Questionnaire (MIQ), the Minnesota Scholastic Aptitude Test (MSAT), and eleven other personal information variables. The results indicate that the VDI was significantly correlated ($P < .01$) with all seven GATB paper and pencil tests, six of the nine MVII scales, four of the 16-PF scales, 15 of the 30 MIQ scales, and only with six of the

11 personal information variables. Interpreting these results, it appears that intelligence was found to be positively related to the VDI; health service, office work and sales-office interests were positively related to the VDI, and mechanical, electronics and outdoor interests were negatively related to the VDI. Females scored higher than males on the VDI, but age, years of education, and prior vocational training were shown to be unrelated to VDI scores for this sample of post high school students. Pucel further found that those who had low VDI scores upon initial testing and were not accepted for vocational training, and who subsequently entered upon employment, increased their VDI scores after a period of employment experience.

Pucel, et al. (1971) again used the VDI and the other instruments listed above to differentiate among graduates and dropouts of vocational technical post-secondary curriculums. The results of the study indicated that the VDI did significantly ($P < .05$) differentiate between males and females, but did not differentiate between graduates and dropouts. Only the 16-PF and the MIQ significantly differentiated between graduates and dropouts in the auto mechanics curriculum.

Family Background--The two family background variables selected for this study are father's educational level and father's occupational level. There is an abundance of literature, especially in sociology, concerning these two variables or similar socio-economic measures; however, only studies related to vocational behavior during the developmental years will be reviewed here.

The now classic study by Hollingshead (1949) was one of the first to call attention to the relationship between socio-economic

status and choice of a career. In the mid-western community of Elmstown, Hollingshead found that the vocationally relevant attitudes of high school students corresponded very closely to the social class of their parents. Parent's educational and occupational levels were some of the variables used objectively to measure social class. In their study of social class in America, Warner, et al. (1949) found occupational level and education to correlate .77 and occupational level and amount of income .87, but larger studies have found smaller relationships as has been pointed out by Reiss, et al. (1961).

Blau and Duncan (1967) in their text on the American occupational structure report the results of a study with over 20,000 respondents representing a national sample in the 20 to 64 age group. One aspect of the study reported zero-order correlations with occupational status to be .32 for father's education, .40 for fat er's occupation, .60 for one's own education and .54 with the occupational status of first job. The authors reach the conclusion that while a man's social origins exert a considerable influence on his chance of occupational success, his own training and early job experiences are even more important.

In their study of the vocational maturity of ninth grade boys, Super and Overstreet (1960) examined the following five socio-economic status variables: parental occupational level, house rating, father's educational level, mother's educational level, and cultural stimulation. They found both parental occupational level and father's educational level to correlate highly significantly ($P < .01$) with all of the other socio-economic measures, and with each other ($r = .45$).

Comparing these two socio-economic variables to all of the other 16 predictors and achievement variables the following correlations were found to be significant at the .05 level--for parental occupational level: intelligence, father identification, family cohesiveness, vocational aspiration level, school curriculum (college versus non-college), peer acceptance, participation in school activities, participation in out-of-school activities, independence, school grades, and achievement versus underachievement--for father's educational level: family cohesiveness, vocational aspiration level, family social mobility, adjustment versus maladjustment, participation in out-of-school activities, and school grades.

Krippner (1963) in a study of the relationships between parents' occupational levels and students' vocational preferences, found that father's occupational levels were significantly related ($P < .01$) to both their sons' and daughters' preferences. The author also found that fathers suggested occupations to their sons that would boost their sons slightly above their own job level. Weinberg and Skager (1966) used a composite parental social status variable made up of father's occupation and mother's and father's education to investigate knowledge about chosen occupations among high school students. Based on the results of correlational analysis they concluded that parental social status was highly related ($P < .001$) to knowledge of chosen occupation, but not to time spent in career guidance. Clark (1967) investigated the influence of sex and social class on occupational preference and perception in grades three through six in New York City schools. His findings indicate that middle class boys and

lower class girls preferred white collar and professional occupations more than did their counterparts. Occupational preceptions differed only for the boys.

Gribbons and Lohnes (1966) in a five-year study of students' educational aspirations used Hamburger's revision of Warner's scale with eighth, tenth and twelfth graders. They found that those students from higher levels aspired to college while those in lower socio-economic groups did not think in these terms. They also found that students generally aspired to educational levels equal to or above that of their parents. In a larger report of their longitudinal study of career development, Gribbons and Lohnes (1968) examined the relationship between socio-economic level of family and father's educational level, and their eight Readiness for Vocational Planning (RVP) scales. Using their sample of 110 boys and girls, they found no significant relationships with these two variables in either eighth or tenth grade.

In an extensive piece of research with a large sample of adolescent boys, Bachman (1970) studied the impact of family background and intelligence on tenth grade boys. For the purpose of the study, Bachman used the following six variables weighted equally to form a measure of socio-economic level: father's occupation, father's education, mother's education, possessions in home, books in home, and rooms per person in home. Many relationships were investigated as part of this study, some of which include those between socio-economic level and self-concept, grades, and aspirations. Socio-economic level was second only to intelligence as a predictor of self-concept of school ability (Eta = .33). In relationship to grades, socio-economic level

led the list of family characteristics predicting good grades (Eta = .26) and was felt by the investigator to have about half of its effect through intelligence and half as its own unique contribution. After partialling out the effect of intelligence and other background factors, socio-economic level still has a substantial effect on both school grades and occupational aspirations. The author concludes that "Socio-economic level is perhaps the most fundamentally important of the family background measures . . . examined" (Bachman, p. 192).

Occupational Aspirations--The question "What occupation do you realistically believe you will enter?" was selected as a variable in this study. Miller and Haller (1964), in preparing to develop an instrument to measure level of occupational aspiration (LOA), make the point that occupational choice questions need to be classified on two dimensions. One dimension is that of realistic versus idealistic choice, and the second dimension is short range versus long range. Osipow (1962) conducted a study on the perceptions of occupations as a function of title and description, and found that occupations are perceived differently when only titles are provided than when minimal descriptions are included.

Examining the stability of occupational aspirations, Thomas (1956) has suggested that students are not as flighty as previous studies have suggested. He recommended that below the eleventh and twelfth grade level, aspirations should be judged for maturity as opposed to realism. Flanagan (1966) using the large 400,000 sample of project TALENT data found that high school students' vocational choices have moderate stability over the high school years. Whitney (1969) in

a review of the literature of the predictive validity of expressed vocational choice concluded that in general, a person's expressed vocational choice predicts his future employment about as well as interest inventories or combinations of personality and background characteristics. Montesano and Geist (1964), examining the differences in occupational choice for boys between ninth and twelfth grades, stated that in their study older youngsters were less concerned about what they liked and more concerned about conditions in the occupational world. The twelfth grade boys were more concerned about factors related to their choices such as their abilities, occupational requirements, conditions of work, and opportunities.

Many of the studies concerning the relationships between occupational aspirations and other variables of interest in this study have been reviewed earlier under other headings. Super and Overstreet (1960) found level of occupational aspiration to be significantly related ($P < .05$) to intelligence, parent's occupational level, father's educational level, cultural stimulation in the home, father identification, school curriculum, peer acceptance, participation in both in-school and out-of-school activities, and school grades. Krippner (1963) found that although boys and girls may prefer different vocations than those suggested by their parents, it is likely that their preference will reflect their family's occupational level. Gribbons and Lohnes (1966) found that those students from higher level socio-economic backgrounds were aspiring to higher level occupations requiring college. In a study of the relationship between occupational preferences and a student's sex and social class, Clark (1967) found

that middle class boys expressed significantly greater preferences for white collar and professional occupations than did lower class boys.

In studies related to level of occupational aspiration and vocational maturity, Bathory (1967) found significant correlations ($P < .05$) of .39 at the ninth grade level and .31 at the twelfth grade level. Asbury (1968) found no relationship between vocational maturity and occupational aspiration level using Miller and Haller's LCA with eighth grade Appalachian boys.

Gribbons and Lohnes (1968) in a seven-year study of career aspiration patterns found that career aspirations are related to actual behaviors in and out of school, to self-concept imagery, to ability, and to family status. They also found their RVP scales were related to educational aspirations in eighth grade, but not for tenth grade.

Bachman (1970), in his large scale study of tenth grade boys reviewed previously in this chapter, found that 85 percent of his sample responded with a specific occupation when asked what sort of work they thought they would do for a living. The aspiration level for those responding was considerably higher than their fathers' present occupations. Over half of the respondents aspired to professional or technical careers. In a previous study, Bachman points out that he found that the aspirations of non-college bound boys show a decline between tenth and twelfth grades and their discrepancy with their father's occupational level becomes less. The author does not believe that tenth grade boys are highly unrealistic in their occupational aspirations. Intelligence and socio-economic level were found to be strong predictors of occupational aspirations at the tenth grade level.

Bachman concludes that ". . . much of the relationship between intelligence and future plans can be viewed as the effect of family background functioning through intelligence as an intervening variable" (p. 175).

Summary

Of the information uncovered in this section of the review of related literature the following appears relevant for this study.

1. As a multiple ability measure, the GATB appears to be very complete and extremely useful for studies related to adolescent career decision making and school achievement in both the academic and vocational-technical areas (Droege, 1965, 1966; Impellitteri and Kapes, 1969; Ingersol and Peters, 1966; Jacobsen, 1965; Kapes, 1969a, 1969b; Pickett, 1958; Samuelson, 1956; Super and Crites, 1962; U. S. Department of Labor, 1967).
2. Occupational values as a career development construct are receiving increasing attention and appear to possess valid and useful relationships to many of the student behaviors of interest in career development research (Dipboye and Anderson, 1959; Gribbons and Lohnes, 1965; Kapes, 1969; Kinnane and Pable, 1962; Singer and Stefflre, 1954; Sprinthall, 1966; Super, 1962; Thompson, 1966; Zytowski, 1970).
3. A strong argument can be made for the essentially ipsative nature of occupational values (Beck and Barek, 1967;

Impellitteri and Kapes, 1970; Kapes, 1969; Katz, 1963; Zytowski, 1970).

4. The Vocational Development Inventory appears to be one of several possible valid measures of the construct of vocational maturity and has been shown to be related to intelligence, age, grade, sex, curriculum, choice and socio-economic status (Asbury, 1968; Bathory, 1967; Crites, 1965, 1969; Crites and Samler, 1967; Dutt, 1968; Gribbons and Lohnes, 1968; Holloway, 1967; Impellitteri, et al., 1969; Pucel, et al., 1970, 1971).
5. The two variables, father's educational and occupational level, appear to contain enough information to be representative of a student's socio-economic background (Blau and Duncan, 1967; Hollingshead, 1949; Reiss, et al., 1961; Super and Overstreet, 1960; Warner, 1949).
6. A student's socio-economic level has been shown to be related to his intelligence, vocational aspirations, curriculum choice, school participation, school grades and overall achievement as well as to other measurable characteristics (Bachman, 1970; Blau and Duncan, 1967; Clark, 1967; Gribbons and Lohnes, 1966, 1968; Hollingshead, 1949; Krippner, 1963; Super and Overstreet, 1960; Weinberg and Skager, 1966).
7. An individual's level of occupational aspiration has been shown to be both a predictor and a resultant of his interaction with his environment, and is stable enough at the

ninth grade level to be useful in developmental research (Asbury, 1968; Bachman, 1970; Bathory, 1967; Clark, 1967; Flanagan, 1966; Gribbons and Lohnes, 1966, 1968; Krippner, 1963; Miller and Haller, 1964; Montesano and Geist, 1964; Super and Overstreet, 1960; Thomas, 1956; Whitney, 1969).

Studies or Other Publications in Career Development or in Other Behavioral Sciences Which Relate to the Methodology and Techniques Used in This Study

When Super and Overstreet (1960) reported the results of the Career Pattern Study's attempt to assess the vocational maturity of ninth grade boys, their sample consisted of 105 boys from Middletown, New York. In addition to descriptive statistics, their primary inferential methodology was the Pearson Product Moment Correlation Coefficient. Since that time, and especially with the advent of the computer, much larger samples of students have been used in longitudinal research and with much more sophisticated statistical methodologies. Gribbons and Lohnes (1968) have also undertaken a longitudinal study similar to the CPS with a small group of students and basically relying on the correlational method with some limited use of discriminant function analysis.

Flanagan, et al. (1962) reported the design for a study of American youth which was begun in 1960 and which sampled a total of 440,000 students in grades nine, ten, eleven and twelve. Under the title of Project TALENT and with the support of the U. S. Office of Education this project has since produced a series of studies focusing

on the behavior of adolescents. The entire operation from data collection to data analysis was computerized and some of the most respected statisticians in the field of educational research have worked on the problem of drawing inferences from the data. A classic example of the application of these resources to career development research is the Project TALENT publication Predicting Development of Young Adults authored by Cooley and Lohnes (1968). In this work, the authors combine multiple regression analysis (MRA) and multiple discriminant function analysis (MDFA) in the study of career patterns. The independent variables used in this study were 22 factor scores derived from a total of 100 indicator scales obtained from a previous Project TALENT study by Lohnes (1966). The use of large samples in human behavior research and the application of MRA and MDFA has in recent years become much more feasible partly because of some of the work of Project TALENT.

Prediger, et al. (1968) have reviewed studies predicting success in high school level vocational education programs for the years 1954 to 1967. The authors report that only five studies using MRA were found, and they were not included in the review of 38 studies all using Pearson Product Moment Correlations. Bachman (1970) in his study with over 2,000 tenth grade boys uses both the Pearson Product Moment Correlation and the Eta which as he explained, is a correlation ratio with more flexibility than the Pearson r.

Moss (1968), addressing himself to the problem of evaluation of occupational education programs, proposed a system for educational evaluation. As part of the system he described three possible inputs

consisting of student characteristics, program characteristics, and intervening influences. Through the use of MRA, Moss demonstrated how with a large sample and adequate measures of the various inputs it would be possible to examine what proportion of the variation in Y (the criterion variable) was due to variation in the various inputs. Given valid and meaningful criterion measures, and a thoughtful selection of independent variables, causal relationships could be hypothesized and tested using cross-validation. Kaufman, et al. (1967) used a multiple regression model, similar to that suggested by Moss, in conducting a cost-effectiveness study comparing vocational and non-vocational education in secondary schools. In one example of their use of the model the criterion variable is average monthly earnings and the independent variables (inputs) are curriculum enrolled in, labor market area, sex, IQ, race, marital status and father's education. In this example, the effect on earnings due to curriculum was being evaluated while controlling for or partialling out the effects of the other intervening variables. In a similar study by Hu, Lee and Stromsdorfer (1971), economic returns to vocational and comprehensive high school graduates were compared. From this study, the authors draw conclusions about the effects of the various inputs on both employment and salary. While these studies focused on program outcomes in terms of earnings or employment, the criteria used could just as easily have been course selection or school achievement.

Rulon, et al. (1967), writing on personnel classification using multivariate statistics, discuss the application of MRA and MDFA. They concluded that MRA is useful for single or two group assignment

problems, but is inadequate for multigroup assignment problems where MDFA is much more appropriate. Walberg (1971) suggests the use of generalized regression models in educational research as an alternative to analysis of variance. He argues for the benefits of MRA which include its ability to handle many continuance variables in psychological research where multiple causation and multiple effects are often being examined. Sonquist (1970), writing on the topic of multivariate model building for sociological research, suggested MRA as a possible strategy when many variables must be considered. The author pointed out, however, that MRA is unable to detect interaction unless interaction terms are built into the model.

Totsouka (1956) developed an approach in which both MRA and MDFA are combined to estimate the joint probability of membership and success in a group. Using eleven independent variables he first predicted the grade point average of seventh semester college students in various majors. He then calculated the discriminant functions necessary to account for all of the explainable variance among the seven groups (college majors) used in his study. By multiplying an individual's probability of achieving a given GPA within a given major by the probability of being a member of that particular major, Totsouka arrived at a joint probability index.

Multiple Discriminant Function Analysis (MDFA) was first proposed by Fisher (1936) when he demonstrated the similarity of the two group discriminant functions to multiple regression. Rulon (1951) made a clear case for the differences between MDFA and MRA although he pointed out that in the dichotomous case it is possible to derive the

one discriminant function by using the values of 1 and 0 for the criterion in a standard MRA. Beyond the two group cases, MDFA becomes much more complex to compute and is based on maximizing the ratio of sum of squares between groups to sum of squares within groups using groups as the criterion. MRA on the other hand is based on minimizing the sum of squares within any one group when predicting the relationship between the independent variables and the criterion for that group. Tiedeman (1951) is credited as being the first to suggest the use of MDFA in guidance research. MDFA, he pointed out, is ideal for finding out whether discrimination among groups is possible or not, and then reducing the size of the variable space necessary to make the classification.

Thorndike and Hagan (1962), in their large scale longitudinal study which sampled 70 percent of 17,000 aviation cadets, were one of the first career development type research projects to use MDFA with a large group. They used twenty variable scores collected in 1943 to calculate the two discriminant functions necessary to plot 22 selected occupational groups obtained from questionnaires circulated in 1955. Their conclusions were that the variables used do unquestionably discriminate among the occupations. The within group variation, however, was found to be still quite large. Astin (1967) used a sample 650 male seniors from the Project TALENT data bank to examine the discriminating power of the personal and environmental characteristics collected when the students were in ninth grade. MDFA was used with the criterion being a seven category breakdown classified according to the student's career choice in grade twelve. Five significant

discriminant functions were obtained and were tested for significance using Wilks' Lambda. These five discriminant functions accounted for 95.17 percent of the discriminating variance available in the 29 variables used.

The most ambitious use of MDFA to classify career groups was the study undertaken by Cooley and Lohnes (1968) in their effort to produce a Career Development Tree. Using Project TALENT data and with three different samples of males all over 10,000 each, the authors were able successfully to classify their samples into one of two dichotomous groups at four different choice points. The independent variables used as predictors were the 22 factor scores generated from the 100 indicator measures originally collected by Project TALENT. Three discriminant functions were generally found to be sufficient to account for most of the explainable variance. In summing up their study, Cooley and Lohnes state:

> The starting point for building a more complex and powerful career prediction model is the research finding that there is a unique and discriminable centroid (profile of mean) for each career pattern in a suitable personality measurement space (p. 5-3).

Prediger (1970) has demonstrated the application of MDFA to the guidance and student selection problem in vocational education. Based on the results of studies with approximately 500 students during 1966-67 and for the successive three years, commercially available ability, interest, and personality measure scores were converted to usable counseling information for incoming vocational students. The 36 independent variables were scores from the GATB, Differential Aptitude Tests, Kuder Preference Record-Vocational, Lorge-Thorndike IQ, a

Personality Questionnaire and previous GPA. The criterion of the MDFA was the 22 vocational program offerings in the Penta County, Ohio, school system. The 36 independent variables were reduced to two discriminant functions which define a space on which the 22 vocational programs could be plotted as points or centroids. Using this two discriminant space, a student is then able to compare his own centroid to the 22 vocational program centroids in order to answer the question, "Which group am I most similar to?"

Writing on the possible future of vocational development theory, Super (1969b) has stated that the career development tree of Cooley and Lohnes appears to be the most promising of the career prediction methods now being worked on. He discussed lattice theory, Markov chains, path analysis, multiple regression and discriminant function analysis as possible statistical methodologies which might be found applicable to a career tree approach to large scale longitudinal research in vocational development.

Summary

1. Large scale longitudinal studies of human behavior using multivariate techniques have become more feasible and profitable in recent years due to the availability of computerization and the subsequent improvement in statistical capabilities (Astin, 1967; Bachman, 1970; Cooley and Lohnes, 1968; Flanagan, et al., 1962; Gribbons and Lohnes, 1968; Super, 1969b; Super and Overstreet, 1960; Thorndike and Hagan, 1962).

2. Multiple regression analysis appears to be one of the more useful statistical techniques for large scale longitudinal research in the behavioral sciences (Cooley and Lohnes, 1968; Hu, Lee and Stromsdorfer, 1971; Kaufman, et al., 1967; Moss, 1968; Rulon, 1967; Sonquist, 1970; Super, 1969b; Totsouka, 1956; Wallberg, 1971).
3. Multiple discriminant function analysis appears to be the most appropriate statistical technique for working with multiple groups in vocational development research (Astin, 1967; Cooley and Lohnes, 1968; Fisher, 1936; Gribbons and Lohnes, 1968; Prediger, 1970; Rulon, 1951; Super, 1969b; Tiedeman, 1951; Totsouka, 1956).

III

PROCEDURE

Population and Sample

The population to which the results of this study may be generalized consists of American male adolescents who could be described as typical of the dominant American culture. To the extent that one considers there to be no dominant American culture, but instead a collection of American subcultures, this study will, of course, generalize more to those subcultures which resemble the sample more closely. Furthermore, it is felt that the sample selected for study is as representative of those groups to whom we attempt to apply our theories of vocational development as any sample of its size which could be collected from one community setting.

The population from which the sample was obtained consists of the total ninth grade enrollment of the three public junior high schools in the city of Altoona, Pennsylvania, during the 1968-69 school year. The Altoona school district has an approximate student population of 15,000 with the ninth grade enrollment during the 1968-69 school year consisting of approximately 1100 boys and girls. The school system is organized according to a six-three-three plan with one large high school and three smaller junior high schools. The educational offerings in the high schools are comprehensive and are housed in two large buildings at one location; one being the old high school and the other a new vocational-technical school which opened

in the fall of 1970. The amount expended for instructional costs per student during the 1968-69 school year amounted to $622.01 which fell slightly below the state average for that year of $681.76 per student.

The city of Altoona has a population of approximately 67,000 and is located in west central Pennsylvania. Although the original economic base of the community relied heavily on the Pennsylvania Railroad shops, the city now has a fairly diversified economy. Rand McNally (1969) classifies the city as a principal business center serving a number of satellite communities. There are both large and small commercial and industrial concerns in the area and the school system draws students from all socio-economic backgrounds.

Initial data were collected during the spring of 1969 when an attempt was made to include all ninth graders in the Altoona public schools. The sample was intended to be used for the purpose of a longitudinal study of vocational development to be conducted by the Department of Vocational Education at The Pennsylvania State University. Of the approximately 550 boys attending ninth grade during the 1968-69 school year, complete data was available on 488 boys or approximately 90 percent of the available population. In order to remain in the sample for the purpose of this study a student needed to have completed tenth grade at the end of the 1969-70 school year and be assigned course grades for that year. Of the 488 boys in the sample at the end of ninth grade, 458 remained in the sample at the end of tenth grade and were available for this study. Of the 30 boys lost to the sample most were reported as having quit school, while some of the boys transferred to other schools.

Essential Data

Independent Variables. In order to establish a rationale for the use of certain student characteristics as predictor or independent variables which could be expected to be related to the criterion, previous studies in vocational development were reviewed. On the basis of this review a number of variables were selected which appear to bear some theoretical relationship with either or both of the criteria selected for this study. The following is a description of the variables selected along with a rationale for why each was selected and how its measure was obtained.

a) Ability Measures--Since the development of the construct of intelligence by Binet many more types of ability measures have been created, validated and studied with increasing degrees of sophistication. Super and Overstreet (1960) selected only a single ability measure (Otis Quick-Scoring mental ability test) for their vocational maturity study. Cooley and Lohnes (1968) used 60 ability variables to establish 11 ability factors, but suggest that these factors could be substituted for by the use of commercially available batteries such as the General Aptitude Test Battery (GATB) and the Differential Aptitude Tests (DAT). Cooley and Lohnes state:

> We think that these results suggest that a series of equating studies involving a representative group of commercial batteries and a suitable sample of subjects would establish acceptable alternative procedures for scaling the MAP ability factors, ... (Cooley and Lohnes, p. 1-31).

In choosing an appropriate commercial battery for this study, consideration was given to its appropriateness for vocational as well as academic students. On the basis of previous studies (Impelliterri and Kapes, 1969) the GATB was selected because it contained manipulative as well as cognitive abilities and because the manipulative ability scores were shown to be related to vocational students' shop grades.

The GATB was developed by the United States Employment Service (USES) in 1947 for use in employment counseling with adults and was later extended for use at the ninth and tenth grade level. The battery takes approximately two and one quarter hours to administer and is composed of 12 subtests which yield the following aptitude scores.

G - Intelligence--General learning ability. The ability to "catch on" or understand instructions and underlying principles; the ability to reason and make judgments. Closely related to doing well in school.

V - Verbal Aptitude--The ability to understand meaning of words and to use them effectively. The ability to comprehend language, to understand relationships between words and to understand meanings of whole sentences and paragraphs.

N - Numerical Aptitude--Ability to perform arithmetic operations quickly and accurately.

S - Spatial Aptitude--Ability to think visually of geometric forms and to comprehend the two-dimensional representation of three-dimensional objects. The ability to recognize the relationships resulting from the movement of objects in space.

P - Form Perception--Ability to perceive pertinent detail in objects or in pictorial or graphic material. Ability to make visual comparisons and

discriminations and see slight differences in shapes and shadings of figures and widths and lengths of lines.

Q - Clerical Perception--Ability to perceive pertinent detail in verbal and tabular material. Ability to observe differences in copy, to proof read words and numbers, and to avoid perceptual errors in arithmetic computation.

K - Motor Coordination--Ability to coordinate eyes and hands or fingers rapidly and accurately in making precise movements with speed. Ability to make a movement response accurately and swiftly.

F - Finger Dexterity--Ability to move the fingers, and manipulate small objects with the fingers, rapidly or accurately.

M - Manual Dexterity--Ability to move the hands easily and skillfully. Ability to work with the hands in placing and turning motions.

Eight of the nine GATB aptitudes were used in this study with aptitude "G" being omitted. It was necessary to omit aptitude G because this particular aptitude is made up of weighted combinations of subtests which are also used in aptitudes V, N and S. Use of such a contaminated variable would make the results of any multivariate statistical analysis difficult to interpret.

b) Occupational Values--Next to abilities, interests and values appear to be the most powerful determinants of vocational choice. In recent years, occupational values have received much attention, and studies of the occupational values of adolescents have probably outnumbered those concerned with occupational interest. This is probably due to the concept of values as predecessors to interests as indicated by Katz (1963). Studies concerning the occupational values of

adolescents have been undertaken by Singer and Stefflre (1954), Dipboye and Anderson (1959), Super (1962), Gribbons and Lohnes (1965), Thompson (1966), and many others. Cooley and Lohnes (1968) have stated "Some aspects of the values of adolescents are quantified by the MAP motives, but much is missing. We wish we had something like the Allport-Vernon-Lindzey 'Study of Values' among our MAP indicators, for example." (p.5-8).

Although a number of instruments for the measurement of occupational values have been developed, the instrument selected for this study is the Occupational Values Inventory (OVI) which has been under development for the past several years. An unpublished monograph co-authored by Impellitteri and Kapes (1970) describes the development of this instrument and reports preliminary validation studies. The unique contribution of this instrument is that it contains actual "valuing tasks" in an ipsative format phrased in a language easily understood by ninth graders. The following seven occupational values are assessed by the OVI.

1. Interest and Satisfaction--One likes the work; enjoys it; is happy at it; fulfills oneself by doing it.

2. Advancement--One perceives the opportunity to get ahead in the work; sees a good future in it; it provides an opportunity to improve oneself.

3. Salary--One perceives the financial return resulting from the work; can make a good living at it; sees it as an opportunity for a good income.

4. Prestige--One is impressed by the respectability attached to the work; can earn recognition from it; desires the feeling of importance that goes with it.

5. Personal Goal--One sees the work as fitting into his way of life; is what one always wanted to do; has been shooting for it; it's the ideal.

6. Preparation and Ability--One can succeed in the work; is good at it; it's where one's talents lie; is suited to it.

7. Security--One can obtain employment in this work; perceives that workers are needed it it; there will always be openings in it.

Four of the seven OVI values were used in this study: Interest and Satisfaction, Salary, Prestige, and Security. Because this instrument is ipsative it is necessary to include fewer than all of the values which the instrument measures in order to make it possible to apply multivariate statistical techniques. The nature of an ipsative instrument is such that the expected intercorrelations among its measures is not zero, but negative. Given scores on six of the values the seventh would be determined and not free to vary independently. In order to allow the values to vary independently it was decided that no more than four values could be used and the four selected were those that showed the greatest promise based on previous studies.

c) Vocational Maturity--One of the first constructs to evolve from research undertaken by Super in his Career Pattern Study (CPS) was that of "vocational maturity." Super (1957) states that "the concept of vocational development leads logically to that of vocational maturity" (p. 185). The

following definition of vocational maturity is provided by Super (1957):

> Vocational Maturity is used to denote the degree of development, the place reached on the continuum of vocational development from exploration to decline. Vocational maturity may be thought of as vocational age, conceptually similar to mental age in early adolescence, but practically different in late adolescence and early adulthood because more distinctions can be made in the developmental curve at those stages (p. 186).

Super and Overstreet (1960) report the results of a study of the vocational maturity of ninth grade boys from which they conclude that many ninth grade boys are not yet ready to make specific occupational choices.

Since the issue of ninth grade choice is central to this study it was necessary to include a measure of vocational maturity. Crites (1965, 1969) has developed an instrument to measure vocational maturity called the Vocational Development Inventory, (VDI), attitude scale. The VDI, which consists of 50 items, is easily administered and yields a single score, has been selected for inclusion in this study. In addition to studies undertaken by Crites to validate the VDI, Impellitteri, et al. (1969) and Pucel, et al. (1970) have shown the usefulness of this instrument in studies involving vocational and technical students.

d) Family background measures--In reviewing studies of vocational development it was found that various measures of family background were included in many of the studies. One of the earliest studies to explore the relationship

between family background and occupational choice was undertaken by Hollingshead (1949) in a small mid-western community. Super (1957, Ch. 7) discusses the role of the family in vocational development and reviews previous research in this area. Super and Overstreet (1960) have included a number of family background variables in their study of the vocational maturity of ninth grade boys. Among the variables they used were parental occupational level, house rating, parents' educational level and cultural stimulation. Gribbons and Lohnes (1968) in a study similar to Super's included a socioeconomic status variable computed using Hamburger's revision of Warner's scale, and father's educational level as a second variable. Blau and Duncan (1967) discuss both the measure and selection of family background variables in studying their relationship to the American occupational structure and occupational mobility.

For the purpose of this study it was decided to use two distinct family background variables--father's educational level and father's occupational level. Information about the family dwelling was not included because it was too difficult to obtain. Mother's occupational level was not used because of the predominance of non-working mothers in the sample, and mother's educational level was excluded because of its high correlation with father's educational level as shown in the previous studies cited. Father's education was recorded according to the following seven

categories which appeared to be the most meaningful: 1) one year through six years; 2) seven years through nine years; 3) ten years through eleven years; 4) high school graduate--twelve years; 5) one year through three years of college; 6) college graduate; 7) college graduate plus additional graduate studies. Father's occupational level was converted to the following six levels of Roe's classification scheme: 1) Professional and Managerial I; 2) Professional and Managerial II; 3) Semi-professional and Small Business; 4) Skilled; 5) Semi-skilled; 6) Unskilled.

e) Occupational aspirations--Since the focus of this study is on vocational development it appears natural to include, as one of the independent variables, a measure of intended occupational choice. All studies reviewed contained some measure of a student's occupational plans or preferences during his early stages of vocational development. Super and Overstreet (1960) found a ninth grade boy's level of occupational aspiration to be related to many of the other variables used in their study including school curriculum and school grades. Other studies by Clark (1967), Gribbons and Lohnes (1968), and Bachman (1970) found career aspiration to be a significant predictor of future vocational behavior.

A number of studies reviewed converted a student's occupational choice to a measure of levels of aspiration such as Miller and Haller (1964) have suggested. Miller

and Haller also point out that the question of occupational preference needs to be classified as to idealistic versus realistic choice. Following their suggestion, both questions were used in collecting this piece of information from the sample. A student's response to the question, "What occupation do you realistically believe you will enter?" was selected for use in this study and was coded according to the six levels of Roe's classification scheme.

Dependent Variables. As indicated previously, two separate dependent or criterion variables were selected for this study. Each of these criterion variables are discussed here along with the manner in which they were obtained.

a) High school curriculum choice--Of the 488 boys with complete data in ninth grade, 458 boys remained in the sample at the end of tenth grade. The Altoona school system provides five curriculum choices in high school: academic, academic business, vocational-technical, home economics and secretarial. Of the five curriculum choices, the boys remaining in the sample were enrolled only in the academic, academic business and vocational-technical curriculums. At the tenth grade level, the academic and academic business curriculums are similar and both offer courses considered preparatory to college. Only nine of the boys in the sample were enrolled in the academic business curriculum and these were grouped together with the academic boys for the purpose of this study to form the curriculum choice titled "academic."

A total of 208 boys remained in the sample in the academic curriculum. The remaining 250 boys in the sample were enrolled in one of the seventeen vocational-technical areas offered in the tenth grade. These boys spent between two and three school periods a day attending shop or laboratory classes in the vocational school. For the purpose of this study this group of 250 boys is referred to as "vocational." The dichotomous variable "curriculum choice" is thus composed of 208 academic boys and 250 vocational boys.

b) Success in high school--This has been previously defined as a student's tenth grade GPA computed as a result of applying a weighted formula. Because the nature of the course experiences differ for the two curriculums it was necessary to devise different methods for computing the GPA in each curriculum.

For the academic boys the GPA was computed using the weighted formula applied by the Altoona school system. This formula gives an additional 20 percent weight to three advanced courses which might be taken in tenth grade--geometry, chemistry, and a third year of a foreign language. The result of this weighting is to create the following grade value presented in Table I. Using the weighted grades for advanced subjects and the unweighted grades for all other major subjects the GPA is computed by summing over all major subjects' grades and dividing by the number of subjects. Only major subjects were used to compute the

Table 1. The Relationship Between Earned and Weighted Grades

Earned Grades		Weighted Grades
5	=	6.0
4	=	4.8
3	=	3.6
2	=	2.4
1	=	1

GPA with such subjects as physical education, art and music being omitted. The number of major subjects included ranged from three to five with five being the most frequent number of subjects taken.

For the vocational boys a different system for computing GPA was felt to be desirable. In all shop or laboratory areas except computer technology and engineering related technology a vocational student spent 50 percent of his day in that particular shop or laboratory. In the case of the two areas mentioned above, the students spent 40 percent of their day in the laboratory. Because of the amount of time spent in the shop or laboratory, and because of the degree of commitment to a particular occupational area required of a vocational student, it was decided to weight a vocational student's end of year shop or laboratory average grade as 50 percent of his GPA. A vocational student generally attends class in three or

four non-vocational subjects during that part of the day when he is not in shop. The 50 percent weighting was obtained by adding together his non-vocational subject grades (including those which received additional weight for advanced subjects if applicable) and dividing by the number of subjects taken. This total was then added to the vocational grade and divided by two to obtain the combined GPA.

Because there may be some question as to the appropriateness of using this combined GPA to account for the success of vocational students as opposed to using eigher only shop or only non-vocational subject grades, a small study was undertaken to examine the relationships among the three different GPA's. The results of this study are presented in Table 2.

Table 2. Correlations Among the Three Measures of School Success for 264 Tenth Grade Boys

Type of GPA	(1)	(2)
(1) Non-vocational subjects GPA		
(2) Shop or laboratory GPA	.58	
(3) Combined GPA	.88	.90

From Table 2 it can be seen that while shop versus non-vocational grades have a correlation of .58 or

approximately 34 percent shared variance, the combined GPA selected for use in this study contains almost all of the information from either of these measures. The common or shared variance between shop and combined GPA is equal to 81 percent and between non-vocational and combined GPA is equal to 77 percent. On the basis of this study it was concluded that the combined GPA was an appropriate measure of school success for vocational students.

Analysis

The statistical methodology employed in this study was twofold. Questions number 1, 2 and 3 were answered using multiple regression analysis (MRA). Question number 4 utilized the technique of multiple discriminant function analysis (MDFA).

The multiple regression model used in answering questions number 1, 2 and 3 is in the following form:

$$y = b_o + b_1 x_1 + b_2 x_2 + \ldots + b_k x_k + e$$

where

y = dependent variable

$x_1, x_2, \ldots x_k$ = independent variable

$b_o, b_1, b_2, \ldots b_k$ = partial regression coefficients

e = error term

The particular equations used here are:

$$y_i = b_o + b_1 x_1 + b_2 x_2 + \ldots + b_{16} x_{16} + e$$

where

y_1 = academic versus vocational curriculum (a dichotomous variable)

y_2 = GPA in the academic curriculum (a continuous variable)

y_3 = GPA in the vocational curriculum (a continuous variable)

and

x_1 = GATB--Verbal Aptitude (V)

x_2 = GATB--Numerical Aptitude (N)

x_3 = GATB--Spatial Aptitude (S)

x_4 = GATB--Form Perception (P)

x_5 = GATB--Clerical Perception (Q)

x_6 = GATB--Motor Coordination (K)

x_7 = GATB--Finger Dexterity (F)

x_8 = GATB--Manual Dexterity (M)

x_9 = Occupational Value--Interest and Satisfaction

x_{10} = Occupational Value--Salary

x_{11} = Occupational Value--Prestige

x_{12} = Occupational Value--Security

x_{13} = Vocational Maturity

x_{14} = Father's Educational Level

x_{15} = Father's Occupational Level

x_{16} = Occupational Aspiration Level

Through the use of multiple regression analysis it is possible to partial out the effects of k-1 independent variables which results in the isolation of the unique contribution to the dependent variable

made by the kth independent variable. This unique contribution holds true only for that exact set of k variables included in the equation. The addition or subtraction of variables to this set would result in a redistribution of the explainable variance among the new set of independent variables. The meaningfulness of the partial regression coefficients then are dependent upon the theoretical meaningfulness of the variables included in the equation. With this consideration in mind the variables included in the investigation have been selected.

The assumptions required for the use of MRA are that:

(Li, 1967, p. 95)

1. Each array of Y of the population follows the normal distribution.
2. The regression of Y on X_1, $X_2 \ldots X_k$ is linear.
3. The variances of all arrays of Y of the population are equal.
4. The samples are drawn at random.
5. The X values remain constant for all samples.

The significance of the overall multiple R was tested using the F-distribution with k and N-k-1 degrees of freedom. This results in a test of the general null hypothesis that all k partial regression coefficients are equal to zero. If the overall F was found to be significant and all partial regression coefficients were not equal to zero, each partial regression coefficient was tested using the F distribution with 1 and N-k-1 degrees of freedom. This results in a test of the hypothesis that $B_k = 0$. Alpha levels of .05 and .01 were used in describing each variable's probable departure from a zero relationship.

Finally, a restricted model containing only those variables making a significant unique contribution to explaining the criterion variable was calculated using a step-down technique and tested as indicated previously.

A number of studies have been undertaken which demonstrate the usefulness of this particular methodology. Kaufman, et al. (1967) have applied this approach to cost-benefit studies of vocational education. Moss (1968) has suggested its use in program evaluation and Impellitteri and others (1969) and Kapes (1969c) have explored its use in career development research.

The computer program selected for this analysis was written by Hallberg (1969) and is available under the title of QSASE at the Penn State Computation Center. This program also provides for a test of the statistical significance of each partial regression coefficient as well as the overall F test.

As stated previously, multiple discriminant function analysis (MDFA) was applied in answering question number 4. This technique is an extension of discriminatory analysis and is used when more than two groups are to be compared. In question number 4, four distinct groups are compared. These groups were formed by first dividing the sample into two groups as is done in question number 1, and then further dividing each of these into successful and unsuccessful groups. This second division was accomplished by dividing each curriculum on the basis of GPA with the median used as the separation point. In this way it was possible to examine the relationships among the four groups described in Table 3.

Table 3. Mean, Standard Deviation and Median GPA for each Curriculum Choice and for the Total Sample, and the Four Group Breakdown Resulting from Dividing each Curriculum on the Median

Curriculum	N	$\bar{X}$	SD	MED	4 Groups	N
Vocational	250	2.89	.83	3.00		
					Successful Vocational	125
					Unsuccessful Vocational	125
Academic	208	3.18	.97	3.00		
					Successful Academic	104
					Unsuccessful Academic	104
Total	458	3.02	.91	3.00		

The purpose of MDFA is to maximize the discriminable information when more than two groups are considered. When using this technique, it is possible to extract k-1 discriminant functions although two discriminant functions are usually sufficient to account for most of the explainable variance. The assumptions required of MDFA are similar to those for MRA; however, MRA is based on minimizing the sum of squares within any one group where as MDFA is based on maximizing the ratio of sum of squares between groups to sum of squares within groups.

In answering question number 4 the overall discriminant ability of the 16 independent variables was tested using the Wilks' Lambda statistic in conjunction with the F-distribution. The significance of each of the three possible discriminant functions was tested using the

Chi-Square distribution. Additional descriptive statistics including the F-Ratio among the four group means for each variable and the correlation between each variable and each function were provided. Alpha levels of .05 and .01 were used throughout to describe the probability of significant differences from a zero relationship.

Finally, each of the four groups was graphically represented in two discriminant space consistant with the number of significant discriminant functions and the percent of each group classified correctly and incorrectly was computed.

A number of researchers over the past twenty years have advocated the use of MDFA in career development research. Only recently, however, has the technique become more readily available with the advancement in computer technology. Rulon (1951) and Tiedeman (1951) have pioneered the use of this technique in guidance type research, but more recently Lohnes (1966) and Cooley and Lohnes (1968) have applied it extensively to Project TALENT data. Prediger (1970) has used MDFA in the study of various vocational technical program differences. Super (1966b) has discussed the use of MDFA and other multivariate techniques as promising career development research tools of the future.

The computer program presented in Veldman (1967) and modified by Hallberg (1971) was used to carry out the MDFA. The modified program written in Fortran IV and titled DSCRIM provided all of the nessary information required in answering question number 4.

IV

FINDINGS

Introduction

The findings of this investigation are reported as they pertain to each of the questions posed previously in the statement of the problem. All statistical information is presented in table form and is discussed in this chapter only to the extent necessary to interpret the meaning of the statistics used. Conclusions concerning the data are discussed in a later chapter.

Before proceding to the questions, several tables of descriptive statistics are presented which will help to provide background information concerning the 16 independent variables used in this study. Table 4 lists the means and standard deviations for each variable, for the total sample and for each of the two curriculums. From Table 4 it can be seen that the means for the GATB variables are usually less than 100 units and the standard deviations are less than 20 units which are the expected values for an adult population. This fact should not be taken to mean that this group falls below their peers nationally, because the means and standard deviations reported here are approximately normal for a sample of ninth graders. It can also be seen that for all of the GATB aptitudes, the academic students scored higher than the vocational students although the differences are smaller for the spatial and dexterity aptitudes.

Table 4. Means and Standard Deviations for the 16 Independent Variables for the Total Sample and for Each Curriculum

Variables		Total Sample (N = 458)		Vocational Curriculum (N = 250)		Academic Curriculum (N = 208)	
No.	Name	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
1.	GATB-Verbal	93.62	10.66	91.21	10.43	96.50	10.24
2.	GATB-Numerical	96.74	12.46	93.79	12.27	100.28	11.78
3.	GATB-Spatial	101.30	16.21	100.42	15.46	102.35	17.04
4.	GATB-Form Perception	99.48	16.64	97.16	17.01	102.26	15.80
5.	GATB-Clerical Perception	100.77	11.49	98.28	11.20	103.75	11.13
6.	GATB-Motor Coordination	89.70	14.59	86.72	14.50	93.29	13.89
7.	GATB-Finger Dexterity	92.55	17.66	92.39	18.04	92.75	17.22
8.	GATB-Manual Dexterity	88.82	17.46	88.21	17.69	89.57	17.18
9.	Value-Interest and Satisfaction	18.44	4.99	17.81	4.95	19.19	4.95
10.	Value-Salary	14.33	6.82	15.11	6.52	13.39	7.07
11.	Value-Prestige	11.25	5.50	10.63	4.94	12.00	6.03
12.	Value-Security	12.03	5.66	12.76	5.43	11.16	5.82
13.	Vocational Maturity	34.82	4.78	34.52	4.74	35.19	4.82
14.	Father's Education[a]	3.94	1.14	3.65	1.02	4.29	1.20
15.	Father's Occupation[b]	4.10	1.08	4.28	.98	3.88	1.15
16.	Occupational[b] Aspiration	3.02	1.10	3.38	.92	2.59	1.14

[a]This variable is coded according to the 7 categories described on page 74

[b]This variable is coded according to the 6 levels of Roe's model described on page 74

The descriptive statistics for the four values are consistent with previous norms (Impellitteri and Kapes, 1970), with academic boys scoring higher on interest and satisfaction, and prestige, and vocational boys scoring higher on salary and security. Academic boys scored higher on vocational maturity than did vocational boys. Those boys in the academic curriculum scored approximately 65 percent of a category higher on father's education which is the equivalent of the difference between 10 to 12 years of education as opposed to some college training. Father's occupational level and occupational aspiration, it must be remembered, have been coded according to Roe's classification with the highest level taking a value of 1 and the lowest a value of 6. Therefore, the lower the number, the higher the level. Academic boys scored considerably higher on level on both of these variables, with the level of occupational aspiration yielding the largest difference.

It is, of course, possible to test the difference between the two curriculum groups on each of these variables using a conventional t-test. This will be left for the reader if he so desires and all of the information necessary for the t-test is provided. From the review of the literature, these variables were selected because they were expected to differentiate between curriculums and between successful and unsuccessful students. The more important questions to answer are those concerning the total unique contributions of all of these variables. For this reason Multiple Regression Analysis (MRA) and Multiple Discriminant Function Analysis (MDFA) have been used in this study. The variables selected must also be considered in terms of their

relationship to one another. As the relationship between two variables increases, the unique contribution possible from either variable decreases. Table 5 presents the zero-order correlations among all of the 16 variables employed in the study. From Table 5 it can be seen that the intercorrelations range from .58 to -.56. Although many of the relationships are statistically significant, the greatest amount of shared variance is equal to 34 percent and most of the relationships yield much lower values.

It is also useful to examine here the simple relationships between each of the independent variables and the criterion for each of the three questions. Table 6 contains the zero order correlation between the 16 independent variables and the dependent variables curriculum choice and GPA for each curriculum. It can be seen that all of the variables bear a significant relationship with at least one of the three criteria, and six of the variables are significantly related to all of them. The size of the correlations ranged from .56 to -.35. In interpreting the correlations it is important to remember that the vocational curriculum is coded =1 and the academic curriculum is =0. Also, for the variables father's occupation and occupational aspiration a negative sign means a positive relationship with a higher level.

Given the raw materials provided in Tables 4, 5 and 6, the 16 independent variables were subjected to MRA and MDFA in order to ascertain the total amount of useful and unique information available to answer the questions posed in the first chapter.

Table 5. Zero-order Correlations Among the 16 Independent Variables For the Total Sample. (N = 458)

Variables	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. GATB-V	.52	.32	.32	.41	.21	.09	.12	.31	-.09	-.02	-.25	.40	.21	-.16	-.28
2. GATB-N		.27	.40	.54	.35	.20	.22	.18	-.08	-.06	-.16	.33	.16	-.10	-.25
3. GATB-S			.43	.23	.05	.32	.20	.18	-.10	-.04	.00	.30	.11	-.15	-.17
4. GATB-P				.58	.37	.33	.37	.15	-.08	-.01	-.09	.19	.05	.00	-.20
5. GATB-Q					.40	.26	.26	.11	-.05	-.01	-.18	.16	.11	-.07	-.25
6. GATB-K			.23	.42	.07	.03	-.05	-.13	.06	.02	.01	-.12			
7. GATB-F				.45	.09	-.02	-.02	-.07	.15	.01	-.07	-.06			
8. GATB-M					.05	-.05	-.03	-.08	.11	.08	-.01	-.06			
9. Interest and Satisfaction						-.48	-.14	-.26	.34	.17	-.13	-.18			
10. Salary							-.12	-.17	-.17	-.19	.11	.09			
11. Prestige								-.19	-.14	.10	-.11	-.07			
12. Security									-.14	-.08	.10	.13			
13. Vocational Maturity										.15	-.14	-.21			
14. Father's Education											-.56	-.24			
15. Father's Occupation												.14			
16. Occupational Aspiration															

$r \geq .10$ Significant at .05 $r \geq .13$ Significant at .01

Table 6. Zero-Order Correlations Between the 16 Independent Variables and the Dependent Variables Curriculum Choice and GPA

Variables No.	Name	Curriculum[a] Choice (N = 458)	Vocational GPA (N = 250)	Academic GPA (N = 208)
1.	GATB--V	-.25**	.41**	.56**
2.	GATB--N	-.25**	.46**	.56**
3.	GATB--S	-.06	.25**	.32**
4.	GATB--P	-.15**	.20**	.26**
5.	GATB--Q	-.24**	.27**	.34**
6.	GATB--K	-.22**	.13*	.08
7.	GATB--F	-.01	.14*	.10
8.	GATB--M	-.04	.15*	.10
9.	Interest and Satisfaction	-.14**	.17**	.30**
10.	Salary	.12*	-.12	-.02
11.	Prestige	-.12*	-.19**	.01
12.	Security	.14**	.01	-.22*
13.	Vocational Maturity	-.07	.32**	.45**
14.	Father's Education	-.28**	.08	.34**
15.	Father's Occupation	.18**	-.08	-.22*
16.	Occupational Aspiration	.36**	-.19**	-.35**

[a] Vocational = 1, Academic = 0

* Significant at .05

** Significant at .01

Question #1

Which characteristics of ninth grade males are predictive of tenth grade enrollment in a vocational versus an academic curriculum?

By first referring back to Table 6 it can be seen that 12 of the 16 independent variables are significantly related at least at the .05 level, to the dependent variable curriculum choice. The GATB variables V, N, P, Q and K are significantly and negatively related to enrollment in the vocational curriculum. The values interest and satisfaction, and prestige are also negatively related to enrollment in the vocational curriculum while salary and security are positively related. Level of father's education, father's occupation, and occupational aspiration are all negatively related to enrollment in the vocational curriculum although the signs for the last two variables are reversed due to a higher number being associated with a lower level in Roe's classification. GATB aptitudes S, F and M and vocational maturity are not significantly related to curriculum choice in this sample.

In order to examine the total amount of unique predictive information available from the 16 independent variables, MRA was undertaken. The results of this full model analysis are presented in Table 7. The total multiple correlation (R) obtained from this analysis is not found on the table, but is equal to .49. The unadjusted coefficient of determination (R^2) is equal to .24. Adjusting the coefficient of determination for degrees of freedom accounts for the shrinkage which could be expected upon cross-validation. The coefficient of determination adjusted for degrees of freedom ($\bar{R}^2$) is approximately equal to .22.

Table 7. Regression Analysis Between the 16 Independent Variables in the Full Model and the Dependent Variable Curriculum Choice[a] (N = 458)

Variables No.	Name	Partial Regression Coefficient	Standard Error	Student "t"
1.	GATB--V	-.0032	.0026	1.24
2.	GATB--N	-.0037	.0022	1.69
3.	GATB--S	.0008	.0015	0.53
4.	GATB--P	.0000	.0017	0.01
5.	GATB--Q	-.0019	.0025	0.74
6.	GATB--K	-.0058	.0017	3.41**
7.	GATB--F	.0010	.0014	0.71
8.	GATB--M	.0022	.0014	1.50
9.	Interest and Satisfaction	-.0003	.0057	0.05
10.	Salary	.0059	.0040	1.48
11.	Prestige	-.0065	.0042	1.54
12.	Security	.0044	.0044	.98
13.	Vocational Maturity	.0077	.0051	1.51
14.	Father's Education	-.0668	.0227	2.95**
15.	Father's Occupation	.0153	.0236	.65
16.	Occupational Aspiration	.1138	.0205	5.54**
	Intercept	1.0823	.4077	

Standard Error of Estimate = .4410

Coefficient of Determination $(\bar{R}^2)^b$ = .2172

Overall F-Ratio $\frac{(MSR)}{(MSE)}$ =8.9255**

[a] Vocational = 1, Academic = 0

[b] Adjusted for degrees of freedom

* Significant at .05

** Significant at .01

The significance of the total relationship is tested by dividing the mean squares regression (MSR) by the mean squares error (MSE) to obtain an F-ratio with k and N-k-1 degrees of freedom. The overall F-ratio for this equation is 8.9255 and is significant beyond the .01 level.

The partial regression coefficient represents the amount of units of the independent variable which is uniquely associated with the choice of the vocational curriculum with the effect of all of the other 15 independent variables partialled out. The standard error of the partial regression coefficient is divided into the partial regression coefficient to obtain a student "t" value which may be compared to a tabled value to "t" with 1 and N-k-1 degrees of freedom. In this manner a partial regression coefficient may be tested for its probable departure from a zero relationship with the criterion. Following this procedure the variables GATB-K, father's education and occupational aspiration are significant at the .01 level. While the other variables do not in themselves possess enough of a unique contribution to be statistically significant, all 16 variables taken together account for approximately 22 percent of the dependent variable curriculum choice. This figure of 22 percent is obtained from the adjusted coefficient of determination ($\bar{R}^2$).

Many of the variables in the full model did not in themselves possess enough unique information to be statistically significant. In order to discover which variables possess the most information which is unique and useful for prediction, a restricted model was calculated. This was accomplished by successively omitting one independent variable at a time on the basis of the least reduction in sum of squares

regression until only independent variables with significant partial regression coefficients at the .05 level remained. The results of this restricted model analysis are presented in Table 8. The overall F-ratio calculated for the restricted model is equal to 22.2414 and is significant well beyond the .01 level. This increase in the F-ratio has been obtained because the MSE has been reduced much more than the MSR due to the elimination of less useful variables. The adjusted coefficient of determination ($\bar{R}^2$) is again equal to .22 and is approximately equal to the percent of variance accounted for when the full model was used. Therefore, without any significant loss in prediction, the six variables remaining in the restricted model possess most of the unique information. The variables remaining in the restricted model as presented in Table 8 are the GATB variables numerical, motor coordination, and manual dexterity, the occupational value prestige, father's education, and occupational aspiration. Interpreting the partial regression coefficients, it can be said that a one unit increase in any of the six independent variables listed results in a change in the dependent variable equal to the size of the partial regression coefficient with the other five variables held constant. As an example, a one unit increase in level of occupational aspiration on Roe's classification is associated with a .1170 increase in the dependent variable which is coded 1 for vocational and 0 for academic. This increase can be attributed to the unique effect of occupational aspiration with the effect of the other five variables held constant. For the sake of prediction, these partial regression coefficients could be used to weight the six variables in the restricted model to achieve a criterion

Table 8. Regression Analysis Between the 6 Independent Variables in the Restricted Model and the Dependent Variable Curriculum Choice.[a] (N = 458)

Variables No.	Name	Partial Regression Coefficient	Standard Error	Student "t"
2.	GATB--N	-.0050	.0018	2.70**
6.	GATB--K	-.0065	.0016	3.98**
8.	GATB--M	.0027	.0013	2.06*
11.	Prestige	-.0094	.0038	2.46**
14.	Father's Education	-.0815	.0188	4.34**
16.	Occupational Aspiration	.1170	.0200	5.86**
	Intercept	1.442	.2297	

Standard Error of Estimate = .4408

Coefficient of Determination $(\bar{R}^2)^b$ = .2181

Overall F-Ratio $\frac{(MSR)}{(MSE)}$ = 22.2414**

[a] Vocational = 1, Academic = 0

[b] Adjusted for Degrees of Freedom

* Significant at .05

** Significant at .01

score which could vary from 0 to 1. The closer to 1 the prediction, the more the student resembles a typical vocational student; the closer to 0, the more the student resembles a typical academic student.

Question #2

What characteristics of ninth grade males who have enrolled in a vocational curriculum in tenth grade are predictive of success in tenth grade as measured by grade point average (GPA)?

In order to examine the simple relationships between the characteristics included in this study and the criterion it is necessary to first examine the zero-order correlations presented in Table 6. Looking at the 16 independent variables, one can see that 12 variables possess a significant relationship with the dependent variable vocational GPA at either the .05 or .01 levels. All of the GATB variables are positively related to vocational GPA while the value interest and satisfaction is positively related and the value prestige is negatively related. Vocational maturity is positively related to GPA while occupational aspiration has a negative sign which indicates a positive relationship between a higher level of aspiration and a higher GPA. The values of salary and security and the family background measures of father's education and father's occupation are not significantly related to vocational GPA in this sample.

In order to examine the total amount of unique information available from the 16 independent variables in predicting vocational GPA, a MRA was computed. The results of this full model analysis are

presented in Table 9. The total multiple correlation (R) obtained from this analysis is not found on the table, but is equal to .55 with the unadjusted coefficient of determination (R^2) equal to .31. The adjusted coefficient of determination ($\bar{R}^2$) is equal to approximately .26 and the significance of the total relationship as tested by the overall F-ratio is equal to 6.4799 and is significant beyond the .01 level. Examination of the partial regression coefficients in the full model indicates that only the GATB variables V and N are significant unique contributors to the prediction of vocational GPA.

Again using the step-down technique a restricted model was computed to ascertain those variables which contributed the most unique and useful information for prediction. The results of the restricted model are presented in Table 10. The overall F-ratio calculated for the restricted model is equal to 31.4568 and is significant well beyond the .01 level. The adjusted coefficient of determination ($\bar{R}^2$) is equal to .27 and reflects a slight increase in precision gained by dropping out the less useful variables. The three variables remaining in the restricted model contain most of the unique information available from the 16 variables in the original full model. The independent variables remaining in the restricted model and which were found to be most useful in predicting vocational GPA are the GATB variables verbal and numerical and the value prestige. Taken together these variables account for approximately 27 percent of the variation in GPA among the 250 vocational students in the sample.

Table 9. Regression Analysis Between the 16 Independent Variables in the Full Model and the Dependent Variable GPA for the Vocational Curriculum. (N = 250)

Variables No.	Name	Partial Regression Coefficient	Standard Error	Student "t"
1.	GATB--V	.0174	.0055	3.17**
2.	GATB--N	.0201	.0050	4.06**
3.	GATB--S	.0035	.0034	1.00
4.	GATB--P	-.0038	.0036	1.04
5.	GATB--Q	.0025	.0053	0.47
6.	GATB--K	-.0023	.0039	0.60
7.	GATB--F	.0002	.0030	0.06
8.	GATB--M	.0040	.0033	1.20
9.	Interest and Satisfaction	.0073	.0128	0.57
10.	Salary	-.0004	.0092	0.04
11.	Prestige	-.0107	.0111	0.97
12.	Security	.0133	.0096	1.38
13.	Vocational Maturity	.0143	.0116	1.23
14.	Father's Education	.0019	.0508	0.04
15.	Father's Occupation	-.0082	.0530	0.15
16.	Occupational Aspiration	-.0653	.0525	1.24
	Intercept	-1.4135	.9193	

Standard Error of Estimate = .7155

Coefficient of Determination $(\bar{R}^2)^a$ = .2604

Overall F-Ratio $\frac{(MSR)}{(MSE)}$ = 6.4799**

[a]Adjusted for Degrees of Freedom

**Significant at .01

Table 10. Regression Analysis Between the 3 Independent Variables in the Restricted Model and the Dependent Variable GPA for the Vocational Curriculum (N = 250)

Variable No.	Name	Partial Regression Coefficient	Standard Error	Student "t"
1.	GATB--V	.0194	.0049	3.9139**
2.	GATB--N	.0223	.4236	5.2651**
11.	Prestige	-.0208	.9242	2.2459*
	Intercept	-.7514	.4607	

Standard Error of Estimate = .7117

Coefficient of Determination $(\bar{R}^2)^a$ = .2684

Overall F-Ratio $\frac{(MSR)}{(MSE)}$ = 31.4568**

[a]Adjusted for Degrees of Freedom

*Significant at .05

**Significant at .01

Question #3

What characteristics of ninth grade males who have enrolled in the academic curriculum in tenth grade are predictive of success in tenth grade?

Question number 3 is exactly like question number 2 except for the change in curriculum which, of course, is accompanied by a change in sample. In order to look at the simple relationships between the 16 independent variables and GPA for academic students an inspection of the zero-order correlations in Table 6 is required. Of the 16 independent variables listed there, 11 are found to be significant at least at the .05 level. Only the GATB variables V, N, S, P and Q possess significant and positive relationships with academic GPA while the manipulative aptitudes K, F and M are found to be non-significant predictors. The value interest and satisfaction is positively related to the criterion while security is negatively related. The values of salary and prestige were not related to academic GPA. Vocational maturity is very highly positively related to GPA in the academic curriculum. Father's education, father's occupation and occupational aspiration are all significantly related to the criterion with the signs of the last two variables being negative, but reflecting a positive relationship between higher level and higher GPA.

The full model MRA between the 16 independent variables and academic average is presented in Table 11. The total multiple correlation (R) is not presented in the table, but is equal to .73 and the unadjusted coefficient of determination (R^2) is equal to .53. The adjusted coefficient of determination ($\bar{R}^2$) is equal to approximately

Table 11. Regression Analysis Between the 16 Independent Variables in the Full Model and the Dependent Variable GPA for the Academic Curriculum (N = 208)

Variables No.	Name	Partial Regression Coefficient	Standard Error	Student "t"
1.	GATB--V	.0178	.0063	2.82**
2.	GATB--N	.0286	.0053	5.38**
3.	GATB--S	.0029	.0036	0.81
4.	GATB--P	.0007	.0045	0.16
5.	GATB--Q	.0037	.0064	0.58
6.	GATB--K	-.0031	.0042	0.74
7.	GATB--F	-.0020	.0034	0.58
8.	GATB--M	-.0023	.0033	0.70
9.	Interest and Satisfaction	.0146	.0137	1.07
10.	Salary	.0088	.0092	0.92
11.	Prestige	-.0023	.0089	0.26
12.	Security	-.0017	.0108	0.16
13.	Vocational Maturity	.0361	.0118	3.06**
14.	Father's Education	.1152	.0567	2.03*
15.	Father's Occupation	-.0235	.0559	0.42
16.	Occupational Aspiration	-.1225	.0456	2.68**
	Intercept	-3.2036	.9448	

Standard Error of Estimate = .6865

Coefficient of Determination $(\bar{R}^2)^a$ = .4954

Overall F-Ration $\frac{(MSR)}{(MSE)}$ = 13.6999**

[a]Adjusted for Degrees of Freedom

*Significant at .05

**Significant at .01

.50 and the significance of the total relationship as tested by the overall F-ratio is equal to 13.6999 and is significant beyond the .01 level. In looking at the partial regression coefficients in the full model, it can be seen that the five independent variables GATB N and V, vocational maturity, father's education, and occupational aspiration are significant unique predictors of academic GPA in the presence of all of the other variables.

Using the step-down technique as was employed in the previous two analyses a restricted model was computed in order to identify the most unique and useful information for prediction. The results of the restricted model are presented in Table 12. The overall F-ratio calculated for the restricted model is equal to 44.0887 and is significant well beyond the .01 level. The adjusted coefficient of determination ($\bar{R}^2$) is equal to .51 and as in the previous analysis reflects a slight gain in precision. The five variables remaining in the restricted model are the same variables which were significant unique contributors in the full model and contain most of the unique information available from the original 16 variables. The variables remaining in the restricted model, all significant at the .01 level, are the GATB variables verbal and numerical, vocational maturity, father's education, and occupational aspiration. Taken together these variables account for approximately 51 percent of the variation in GPA among the 208 academic students in the sample.

Table 12. Regression Analysis Between the 5 Independent Variables in the Restricted Model and the Dependent Variable GPA for the Academic Curriculum (N = 208)

Variables No.	Name	Partial Regression Coefficient	Standard Error	Student "t"
1.	GATB--V	.0220	.0057	3.83**
2.	GATB--N	.0290	.0046	6.30**
13.	Vocational Maturity	.0363	.0110	3.29**
14.	Father's Education	.1359	.0420	3.24**
16.	Occupational Aspiration	-.1290	.0438	2.95**
	Intercept	-3.3821	.5831	

Standard Error of Estimate	=	.6765
Coefficient of Determination $(\bar{R}^2)^a$	=	.5099
Overall F-Ratio $\frac{(MSR)}{(MSE)}$	=	44.0887**

[a]Adjusted for Degrees of Freedom

**Significant at .01

Question #4

What characteristics of ninth grade males differentiate among the following four tenth grade groups?

a. successful vocational students

b. unsuccessful vocational students

c. successful academic students

d. unsuccessful academic students

Question number 4 differs from the previous three questions in that the criterion is neither a dichotomous nor a continuous variable. In this question the criterion is composed of 4 mutually exclusive categories that combine the variables of course selection and success which were handled separately in the previous analysis. In this way it is possible to ascertain the overall predictive strength of the 16 independent variables when they are used to differentiate among the 4 categories which simultaneously consider group membership and success. By combining this information with information obtained from the previous analyses, student characteristic variables are identified which contribute the greatest amount of information about course selection and success simultaneously.

In order first to examine the ability of each of the 16 independent variables to differentiate among the 4 groups, means for each group were computed on each variable and tested using the F-ratio with k-1 and N-1 degrees of freedom. This analysis does not consider the intercorrelations among variables (Table 5), and therefore the total amount of discriminant information is considerably less than the sum of the discriminant information available from each variable. The

results of the preliminary analysis are presented in Table 13. By examining the table it can be seen that 14 of the 16 independent variables significantly discriminate among the four groups, and all but one are at the .001 level. Only the GATB variables F and M do not have statistically significant F-ratios over the four group means. The size and direction of differences among group means can be observed from inspection of Table 13.

In order to arrive at the combined discriminant strength of the 16 independent variables in maximizing the total differences among the 4 groups, MDFA was undertaken. As was stated previously, this technique seeks to maximize the ratio of between group sum of squares to within group sum of squares. The results of this analysis are presented in Table 14. In order to first answer the question as to whether or not the information contained in the 16 variables is sufficient to produce significant discrimination, the Wilks' Lambda statistic was computed and tested using the F-ratio. From the table it can be seen that the overall F-ratio is equal to 6.455 which is significant at the .0001 level. The significance of each of the three possible discriminant functions (DF) is tested using the Chi Square distribution. The obtained Chi square values as reported in Table 14 indicate that DF I and DF II are significant at the .0001 level, while DF III is not significant at the .05 level. DF I extracts 78.59 percent of the explainable variance; DF II extracts 18.43 percent; while DF III extracts only 2.98 percent. Taken together, the three possible DF extract 99.99 percent of the explainable variance (3 roots extract 99.99 percent of trace).

Table 13. Group Means and Overall F-Ratio for the 16 Independent Variables Among the 4 Groups: Successful Vocational, Unsuccessful Vocational, Successful Academic, Unsuccessful Academic

Variables No. Name	(N = 125) Successful Vocational 1	(N = 125) Unsuccessful Vocational 2	(N = 104 Successful Academic 3	(N = 104) Unsuccessful Academic 4	F-Ratio
1. GATB-V	94.45	87.98	100.96	92.05	35.73**
2. GATB-N	98.19	89.39	105.69	94.88	42.98**
3. GATB-S	103.94	96.89	106.63	98.08	9.86**
4. GATB-P	99.42	94.91	106.29	98.23	9.65**
5. GATB-Q	100.82	95.75	107.21	100.30	21.44**
6. GATB-K	88.51	84.93	94.62	91.96	10.09**
7. GATB-F	93.45	91.33	94.62	90.89	1.09
8. GATB-M	90.19	86.22	91.31	87.83	2.01
9. Interest and Satisfaction	18.58	17.04	20.56	17.82	10.75**
10. Salary	14.51	15.71	13.36	13.41	3.10*
11. Prestige	9.67	11.58	11.39	12.60	5.91**
12. Security	12.66	12.87	10.08	12.24	5.79**
13. Vocational Maturity	35.71	33.33	36.97	33.41	17.16**
14. Father's Education	3.74	3.56	4.60	3.97	19.70**
15. Father's Occupation	4.30	4.26	3.79	3.98	5.77**
16. Occupational Aspiration	3.30	3.46	2.25	2.92	31.98**

* Significant at .05
** Significant at .001

Table 14. Zero-Order Correlations Between the Three Discriminant Functions Generated (Among the 4 Groups) and the 16 Independent Variables. (N = 458)

Variable No.	Name	DF I	DF II	DF III
1.	GATB--V	.70	.22	.10
2.	GATB--N	.74	.27	.24
3.	GATB--S	.34	.36	.03
4.	GATB--P	.40	.06	-.07
5.	GATB--Q	.56	.05	.15
6.	GATB--K	.37	-.22	.43
7.	GATB--F	.11	.14	-.10
8.	GATB--M	.16	.14	.14
9.	Interest and Satisfaction	.41	.14	-.12
10.	Salary	-.18	.14	-.45
11.	Prestige	-.01	-.54	-.12
12.	Security	-.30	.10	.34
13.	Vocational Maturity	.44	.47	-.17
14.	Father's Education	.53	-.22	-.22
15.	Father's Occupation	-.26	.31	.11
16.	Occupational Aspiration	-.64	.37	.23
Chi Square		213.41*	59.91*	10.25
% Variance Extracted		78.59	18.43	2.98
Wilks' Lambda .531			Overall F-Ratio 6.455*	

*Significant at .0001

In interpreting the DF's, one possible approach is to use the eigenvectors or weights for each variable in the function. These weights are often difficult to interpret and so an alternate method which computes the correlation between each function and each variable was selected. The zero-order correlations between each of the functions and each variable are presented in Table 14. An examination of these correlations provides the information necessary to give a meaning and select a name for each function. A function can be identified by contrasting the high positive correlations with high negative correlations. The signs for variables 15 and 16 need to be reversed for this comparison since the levels of Roe's classification scheme use lower members to represent higher levels. In naming DF I it was observed that GATB aptitudes V, N and Q and the socioeconomic level variables father's education and occupational aspiration possessed positive correlations of .53 or higher. No high negative correlations were observed relative to the high positives. It was decided to name DF I Cognitive-Socioeconomic. DF II has overall lower correlations from which to choose because most of the explainable variance is accounted for by DF I. In naming DF II the variables vocational maturity (with a high positive correlation of .47) and prestige (with a high negative correlation of -.54) were combined to form the descriptor Vocational Maturity versus Prestige. DF III which was not found to be statistically significant will not be named.

In order to examine the efficiency of the DFA the percent of each group which would be classified correctly into its own group as well as those classified incorrectly into one of the other groups was

computed. Table 15 presents the information concerning classification with the diagonal elements of the matrix representing correct classification. It can be seen that 70.20 percent of the successful academic students are correctly classified while only 37.50 percent of the unsuccessful academic students are correctly classified. For vocational students the MDFA has correctly classified 64 percent of the unsuccessful students, and 52 percent of the successful students. It is also interesting to note that when vocational students are misclassified they are more likely to be classified into the opposite vocational group. However, when academic students are misclassified they are more likely to be classified into the vocational groups with the successful vocational group receiving the majority.

The discriminant centroids for each group are presented on the right side of Table 15. In order to make it easier to visualize the four groups they are graphically displayed in the space defined by the two significant DF's in Figure 4. From this graphic presentation it can be seen that DF I (Cognitive-Socioeconomic) separates successful academic from all three others, and unsuccessful vocational from the other two groups. DF II (Vocational Maturity versus Prestige) separates successful vocational and unsuccessful academic with unsuccessful vocational and successful academic falling in the middle. Although each group is represented as a point on this graph, it must be remembered that the members of each group are scattered over the graph around the point. The density of each point can be surmized from the percent correctly classified for each group as presented in Table 15.

Table 15. Percent of Each Group Classified into the 4 Possible Groups and Group Centroids for Each of the 3 Discriminant Functions

	% Classified in Each Group					Group Centroids		
	Group 1	Group 2	Group 3	Group 4	Total	DF I	DF II	DF III
Group 1 Successful Vocational	<u>52.00</u>	26.40	15.20	6.40	100%	16.47	17.70	.60
Group 2 Unsuccessful Vocational	20.00	<u>64.00</u>	2.40	13.60	100%	15.02	16.63	-.06
Group 3 Successful Academic	17.30	4.80	<u>70.20</u>	7.70	100%	18.87	16.65	-.03
Group 4 Unsuccessful Academic	23.08	23.08	16.34	<u>37.50</u>	100%	16.43	15.80	.77

——— Diagonal Elements Represent Percent Correctly Classified

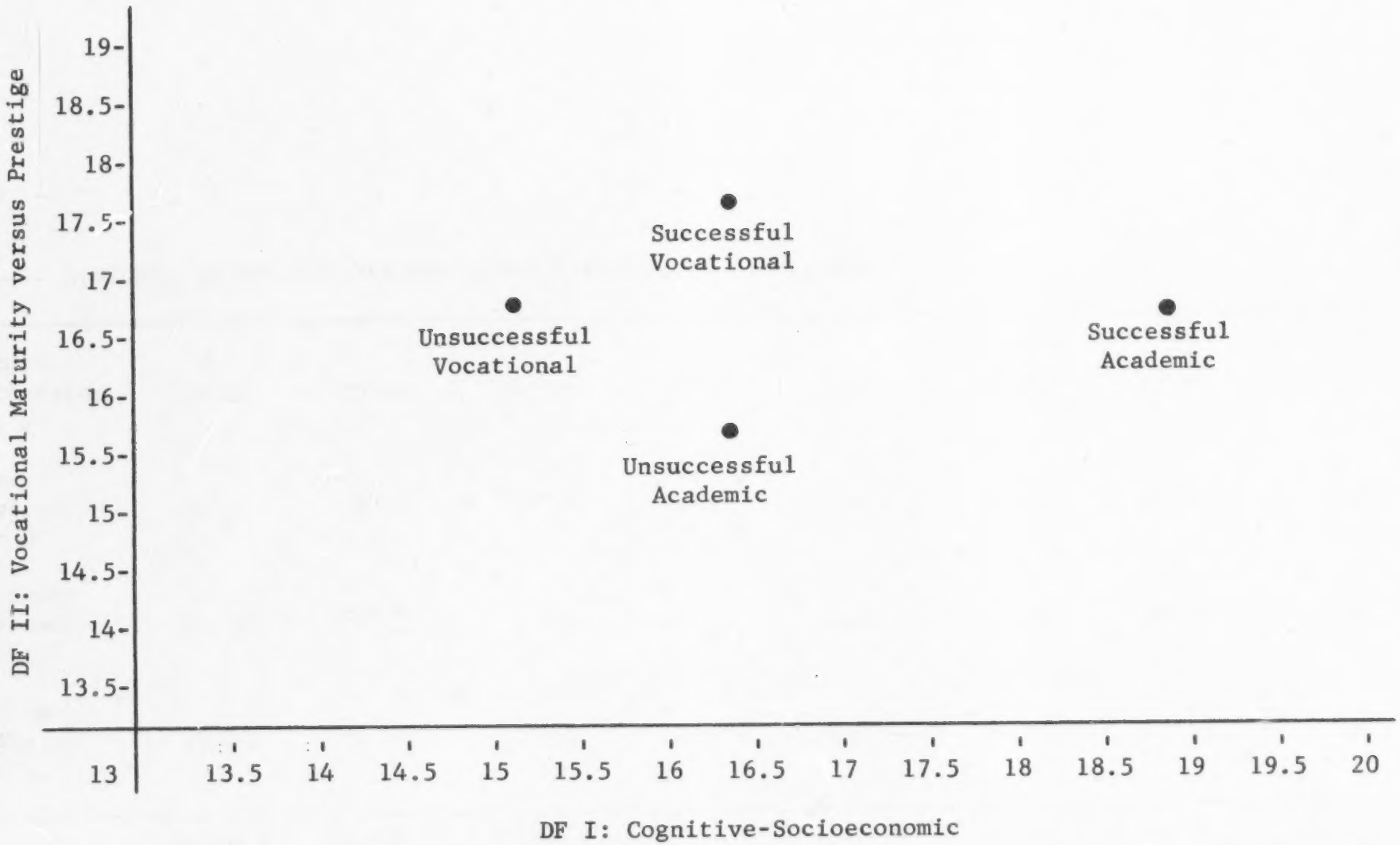

Figure 4. Centroids of 4 Groups in Two Discriminant Space

V

SUMMARY, CONCLUSIONS, IMPLICATIONS AND RECOMMENDATIONS

Chapter V provides a summary of this study, conclusions based on the findings, implications for vocational development theory, and recommendations for further study.

Summary

Introduction

Informal theories concerning why people work have existed since before the time of Christ, but it is only in recent years that formal theories concerning the vocational development process have been postulated and researched. The most researched and productive theory currently appears to be that proposed by Donald Super. Aspects of Super's theory have been applied and extended by a number of other researchers, and the application of interest in this study is that proposed by Cooley and Lohnes in their "Career Development Tree." Within the basic framework of Super's theory, this study attempted to apply and extend the work of Cooley and Lohnes.

Statement of the Problem

This study was partly a replication of the Cooley and Lohnes study to the extent that it used an alternate set of personality trait measures to predict a dichotomous curriculum choice at the end of ninth grade. The study was also an extension of the Cooley and Lohnes work

in that it attended to the degree of belongingness to the chosen group in the sense of being a successful or unsuccessful member of that group.

The purpose of this study was to obtain answers to the following specific questions:

1. What characteristics of ninth grade males are predictive of tenth grade enrollment in a vocational versus an academic curriculum?
2. What characteristics of ninth grade males who have enrolled in the vocational curriculum in tenth grade are predictive of success in tenth grade as measured by grade point average (GPA)?
3. What characteristics of ninth grade males who have enrolled in the academic curriculum in tenth grade are predictive of success in tenth grade as measured by grade point average (GPA)?
4. What characteristics of ninth grade males differentiate among the following four tenth grade groups?
   a. successful vocational students
   b. unsuccessful vocational students
   c. successful academic students
   d. unsuccessful academic students

Procedure

The sample utilized in the study consisted of 458 male students who had completed tenth grade in the Altoona, Pennsylvania, senior high school and who were enrolled in either the vocational or academic

curriculums. Preliminary student characteristic data had been gathered the previous year when the students were enrolled in ninth grade in the three public junior high schools in Altoona. Criterion information was collected at the end of tenth grade. All data were gathered as a part of a longitudinal study of vocational development being conducted in the Department of Vocational Education at The Pennsylvania State University.

In all, 16 student characteristic variables were selected as independent variables for this study. These independent variables include the General Aptitude Test Battery (GATB) aptitudes of Verbal, Numerical, Spatial, Form Perception, Clerical Perception, Motor Coordination, Finger Dexterity, and Manual Dexterity; the occupational values of Interest and Satisfaction, Salary, Prestige, and Security; the construct of Vocational Maturity; the family background measures of Father's Education and Father's Occupational Level, and the student's realistic Occupational Aspiration. The dependent variables used were enrollment in the vocational or academic curriculum which was coded 1 or 0, and the students' GPA in either curriculum computed using a weighted formula. GPA was used as a continuous variable in answering questions 2 and 3, and was divided at the median to form the 4 groups which were compared in question 4.

Analysis of the data employed two different statistical methodologies. Questions 1, 2 and 3 were answered using multiple regression analysis (MRA) with both full models and restricted models using a step-down technique. Question number 4 utilized the technique of

multiple discriminant function analysis (MDFA) in comparing the four groups.

Findings

Zero-order correlations among the 16 independent variables as well as between the independent variables and the dependent variables were calculated. The overall intercorrelations among the 16 independent variables were found to be relatively low overall and ranged from .58 to -.56. The correlation between the independent variables and the criteria ranged from .56 to -.35, and all independent variables were significantly related at the .05 level to at least one of the criteria.

Using MRA, the 16 independent variables in the full model yielded a multiple R of .49 with the dependent variable curriculum choice. The adjusted coefficient of determination ($\bar{R}^2$) was equal to .22 and the overall F-ratio was significant at the .01 level. The restricted model for curriculum choice yielded an $\bar{R}^2$ of .22 with the variables GATB Numerical, GATB Motor Coordination, GATB Manual Dexterity, Prestige, Father's Education, and Occupational Aspiration being the significant unique predictors of curriculum choice.

When GPA for the vocational curriculum was used as the dependent variable in the full model the multiple R was equal to .55 and the $\bar{R}^2$ was equal to .26 with an F-ratio significant at the .01 level. The restricted model for vocational GPA yielded an $\bar{R}^2$ of .27 with the variables GATB Verbal and Numerical and the value Prestige being the significant unique predictors of Vocational GPA. The full model for GPA in the academic curriculum produced a multiple R of .73 with $\bar{R}^2$

equal to .50 and the F-ratio significant at the .01 level. In the restricted model, the $\bar{R}^2$ was equal to .51, and the variables GATB Verbal and GATB Numerical, Vocational Maturity, Father's Education, and Occupational Aspiration were found to be significant unique predictors of academic GPA.

In comparing the groups created in question 4 it was found that all but 2 of the 16 independent variables discriminated significantly among the 4 groups using an overall "F" test. MDFA was conducted and the overall Wilks' Lambda statistic was found to be significant at the .0001 level. Using the Chi Square distribution, two significant discriminant functions (DF) were found and were named Cognitive-Socioeconomic and Vocational Maturity versus Prestige as a result of inspection of correlations between the independent variables and the DF. The DF were found to classify correctly 52 percent of the successful vocational group, 64 percent of unsuccessful vocational group, 70 percent of the successful academic group and 38 percent of the unsuccessful academic group. Group centroids were computed and the groups were plotted in two discriminant space.

Conclusions

Question #1

This question is concerned with establishing which ninth grade student characteristics are related to the choice of a vocational versus an academic curriculum in tenth grade. In examining the zero-order correlations presented in Table 6 it was found that 12 of the 16

student characteristic variables used in the study were significantly related to curriculum choice at least at the .05 level. Only the GATB aptitudes Spatial, Finger Dexterity and Manual Dexterity and the construct Vocational Maturity were not significantly related to the criterion. When MRA was undertaken with these 16 independent variables the multiple correlation obtained was .49 while the highest zero-order correlation between the criterion and Occupational Aspiration was equal to .36. However, because of the intercorrelation among the 16 independent variables (Table 5), the 15 independent variables in addition to Occupational Aspiration resulted in only a small increase in the multiple R. The results of the restricted model indicate that only 6 of the independent variables are necessary to provide almost all of the unique information available from the original 16 independent variables. In fact, these six variables result in no loss in the proportion of variance accounted for which can be seen by comparing $\bar{R}^2$ in the full and restricted models. Whatever loss of information did occur was compensated for by reducing the number of variables and therefore the amount of error involved.

The variables found to contribute a significant amount of unique information in predicting curriculum choice in tenth grade were the GATB aptitudes Numerical, Motor Coordination and Manual Dexterity; the value Prestige; Father's Education, and Occupational Aspiration. No previous literature was available on the relationship between GATB aptitudes and curriculum choice although Pucel (1971) found that the GATB paper and pencil aptitudes did not differentiate between graduates and dropouts of post-secondary vocational programs. It is also

interesting to note that although GATB aptitude Manual Dexterity possessed a very small relationship with the criterion, it was selected as a unique variable in the restricted model.

Previous research (Kapes, 1969c) agreed with the finding that vocational students valued Prestige less than did academic students. Prestige was also found to be more important to males by Gribbons and Lohnes (1965). Much literature is available on the relationship between Father's Education and Curriculum or Occupational Choice. Super and Overstreet (1960) found parental occupational level related to curriculum choice. Krippner (1963) found parents' occupational level related to son's and daughter's preferences. Similar findings were reported by Clark (1967), Gribbons and Lohnes (1966) and Bachman (1970). Level of Occupational Aspiration was related to curriculum choice in the study by Super and Overstreet (1960) and was also found to be highly related to Father's educational level in many other studies (Krippner, 1963; Gribbons and Lohnes 1966; Bachman, 1970). The fact that level of Occupational aspiration and Father's education both possess enough unique predictive information to be included in the restricted model indicated that they are sufficiently independent to warrant separate attention.

Conclusions concerning the relationship between the 16 independent ninth grade variables in this study and tenth grade curriculum choice are as follows:

1. While 12 of the variables correlate significantly with the criterion, all of the variables taken together account for only 22 percent of the variance associated with the choice

of a vocational versus an academic curriculum in tenth grade, and six of these variables possess most of the unique information available from the initial 16 variables.

2. The choice of a vocational versus an academic curriculum in tenth grade is uniquely and positively related to the GATB aptitude Manual Dexterity, and uniquely and negatively related to the GATB aptitudes Numerical and Motor Coordination, the value Prestige, amount of Father's Education and level of Occupational Aspiration.
3. Enrollment in a vocational versus an academic curriculum is not as easily predicted as is success in either curriculum.

Question #2

In question number 2, the rela ionship between ninth grade student characteristics and tenth grade GPA in the vocational curriculum is examined. Using zero-order correlations (Table 6) it was found that 12 of the 16 independent variables were significantly related at least at the .05 level. Those variables not related were the values Salary and Security and the family background variables, Father's Education and Father's Occupational Level. All of the GATB aptitudes were significantly positively correlated with the criterion. The highest zero-order correlation, between GATB Numerical and the criterion, was equal to .46 while the total multiple R using all 16 independent variables was equal to .55. This small increase in the correlation can be attributed to the small amount of additional unique information available from the other 15 independent variables. When the restricted

model was calculated only 3 independent variables were found which possessed a significant amount of unique relationship with vocational GPA. The proportion of variance accounted for corrected for degrees of freedom ($\bar{R}^2$) in the restricted model was equal to .27 which represents a slight increase over the $\bar{R}^2$ in the full model due to elimination of error associated with the variables which were excluded.

The variables which were found to contribute a significant amount of unique information in predicting vocational GPA in tenth grade were the GATB aptitudes Verbal and Numerical and the value Prestige. In previous studies, Samuelson (1956) found multiple correlations between three selected GATB aptitudes and various measures of shop success to be in the range of .50 to .83. The U. S. Department of Labor (1967) reported average correlations between course grades or rank in class and the GATB aptitudes Verbal equal to .53 and Numerical equal to .50. Jacobsen (1965) found the GATB aptitude Numerical to be the best predictor of overall academic success. Ingersoll and Peters (1966) found a multiple correlation of .64 between all GATB aptitudes and GPA for vocational and academic ninth and tenth graders. In the same study aptitudes Verbal and Form Perception correlated .62 with grades in Mechanical Drawing. Droege (1963) used General Intelligence, Verbal, Clerical Perception and Manual Dexterity to predict success in a vocational printing course and found a multiple correlation of .38. In several other studies (Ipellitteri and Kapes, 1969; Kapes, 1969a; Kapes, 1969b) GATB aptitudes G, N, S, P, K and M were found to be the best predictors of vocational shop grades. Studies concerning the value Prestige and vocational GPA were not found in the literature

although Gribbons and Lohnes (1965) found that boys valued prestige more than did girls. Sprinthall (1966) found no relationship between occupational values and academic achievement. Stefflre (1959) found college aspirants to value Self-realization and non-college aspirants to value Salary and Security. The results of the Stefflre study appear to be in agreement with the findings when only zero-order correlations are considered.

Conclusions concerning the relationship between the 16 independent ninth grade variables used in the study and tenth grade vocational GPA are as follows:

1. While 12 of the variables correlate significantly with the criterion, all of the variables taken together account for only 27 percent of the variance associated with vocational GPA, and 3 of the variables possess most of the unique information available from the initial 16 variables.
2. All of the GATB aptitudes are positively related to vocational GPA, but the aptitudes Verbal and Numerical account for most of the information available from the entire eight variables.
3. The value Prestige is negatively related to vocational GPA and contains enough unique information to warrant its use in addition to the GATB variables Verbal and Numerical.
4. Success in vocational curriculum is much less predictable than success in the academic curriculum.

Question #3

Question number 3 is concerned with the relationship between ninth grade student characteristics and tenth grade GPA in the academic curriculum. Examining the zero-order correlations in Table 6 it can be seen that 11 of the 16 independent variables are significantly related at least at the .05 level. The GATB manipulative aptitudes Motor Coordination, Finger Dexterity and Manual Dexterity are not related to the criterion as they were in the vocational curriculum. Salary and Prestige are also unrelated to academic GPA, while in the vocational curriculum Prestige was found to be a significant unique predictor. The highest zero-order correlation of .56 was produced by both the GATB Verbal and Numerical aptitudes. Using MRA, a multiple R of .73 was obtained between the 16 independent variables and the criterion which represents a large increase contributed by the remaining variables. When the restricted model was calculated, five variables were found to possess a significant amount of unique relationship with academic GPA. The proportion of variance accounted for corrected for degrees of freedom ($\bar{R}^2$) in the restricted model was equal to .51 which represented a slight increase over $\bar{R}^2$ in the full model.

The variables which were found to contribute a significant amount of unique information in predicting academic GPA in tenth grade include the GATB variables Numerical and Verbal which agree with the findings for the vocational curriculum. Vocational Maturity, Father's Education, and Occupational Aspiration which were not significant unique predictors in the vocational curriculum were found to be significant in the academic curriculum. The studies cited previously (Samuelson, 1956; U. S. Department of Labor, 1967; Jacobsen, 1965;

Ingersoll and Peters, 1966) all agree with the finding that the GATB Verbal and Numerical are the best predictors of academic GPA. The Department of Labor Study also found that GATB aptitudes Spatial, Motor Coordination, Finger Dexterity and Manual Dexterity to be the poorest predictors of academic SPA which again agrees with these findings. Studies by Crites (1969) and others indicate the Vocational Maturity is related to both general intelligence and socioeconomic level; however, enough of whatever is measured by the VDI is unique to warrant its inclusion in the restricted model. Studies by Gribbons and Lohnes (1968), Bathony (1967), Halloway (1967) and Dutt (1968) all found differences on VDI scores favoring the academic curriculum; however, no such differences were found in this study. No study reviewed found the VDI to be related to success in the academic curriculum although such relationships were found in the vocational curriculum (Pucel, et al., 1971). Whatever relationship was found to exist between the VDI and academic success in previous studies apparently was accounted for by intelligence or socioeconomic background, but this is not the case in this study.

Father's education was found to be related to school grades by Super and Overstreet (1960) and by Bachman (1970). The latter felt that half of the effect of family background operated through intelligence, while half was unique to itself. Given the correlations between the GATB variables Verbal and Numerical and Father's Education found in this study (.21 and .16 respectively), the Bachman assumption appears plausible. The literature on Occupational Aspiration Level indicates that this variable is related to a least half of the other variables

included in this study (Super and Overstreet, 1960; Clark, 1967; Bathony, 1967; Gribbons and Lohnes, 1968) and yet it was found to be a significant unique predictor of academic GPA. Super and Overstreet (1960) found a relationship between Occupational Aspiration and school grades as well as with in-school and out-of-school activities. Bachman (1970) again feels that this variable is highly related to family background which affects academic success directly and through intelligence.

Conclusions concerning the relationship between the 16 independent ninth grade variables used in this study and tenth grade academic GPA are as follows:

1. Although 11 variables correlate significantly with the criterion, only five of the variables are necessary to account for most of the explainable variance and these variables account for 51 percent of the variance associated with academic GPA.
2. While all five non-manipulative GATB aptitudes are positively related to academic GPA, only aptitudes Verbal and Numerical are necessary to provide most of the unique information contained in all five variables.
3. Vocational Maturity, Father's Education and level of Occupational Aspiration are all positively related to academic GPA, and along with the GATB aptitudes Numerical and Verbal provide most of the unique information contained in the entire set of 16 variables.
4. Success in the academic curriculum is much more predictable than success in the vocational curriculum.

Question #4

Question number 4 asks what characteristics of ninth grade males differentiate among four groups: successful vocational, unsuccessful vocational, successful academic, and unsuccessful academic. Preliminary computation of a one way ANOV for each variable indicated that all of the 16 independent variables except Finger Dexterity and Manual Dexterity differentiated among the four groups. MDFA was undertaken and two significant DF's were found. The particular design used in this analysis combines the information about curriculum selection and success which were each handled separately in the preceeding three questions. By examining the correlations between the DF and each of the 16 variables DF I was named Cognitive-Socioeconomic and DF II was named Vocational Maturity versus Prestige. Since no additional unique information is available in creating the DF than was available when each of the previous three analyses were conducted, the variables providing most of the discriminating information should be those variables found to contain most of the unique information in the MRA. Table 16 provides a comparison of the significant unique predictors provided from the three MRA and those same variables as they are related to the DF. From Table 16 it can be seen that the variables found to be significant unique predictors in the MRA were also those variables found to correlate highly with the DF. Six of the seven variables in Table 16 loaded highest on one of the two significant DF's. Manual Dexterity which was only minimally related to curriculum choice yielded very small correlations with the DF.

Table 16. A Comparison of the Variables in the 3 MRA Restricted Models and Variable Correlations with the DF

Variables No.	Name	Curriculum Choice	Vocational GPA	Academic GPA	DF I	DF II
2.	GATB--V	X	X	X	.70	.22
6.	GATB--N	X	X	X	.74	.27
8.	GATB--M	X			.16	.14
11.	Prestige	X	X		-.01	-.54
13.	Vocational Maturity			X	.44	.47
14.	Father's Education	X		X	.53	-.22
16.	Occupational Aspiration	X		X	-.64	.37

When the DF's were used to classify students into one of the four groups it was found that successful academics were the most accurately classified (70%) while unsuccessful academics were the least accurately classified (38%). From the classification data it appears that vocational students whether successful or unsuccessful are at least correctly classified as vocational students while academic students when they are unsuccessful are more likely to be classified as either successful or unsuccessful vocational students. A plot of the group centroids indicates the DF I represents successful vocational and unsuccessful academic students as being similar while unsuccessful vocational and successful academic students possess less and more respectively of DF I. DF II represents successful academic and unsuccessful academic students as being similar while successful vocational students score higher and unsuccessful academic students score lower on

this DF. Transposing the DF into unique and discriminating student characteristics it appears that successful academic students have relatively high verbal and numerical aptitudes, aspire to high level occupations and have fathers who have completed more education, while both successful vocational and unsuccessful academic students have moderate amounts of these characteristics, and unsuccessful vocational students have the least amount of these characteristics. Also, successful vocational students are most likely to be fairly high on vocational maturity and place little value on prestige while unsuccessful academic students are more likely to be the opposite on these characteristics. DF II appears to be a realism factor with successful students in each curriculum being more realistic in their choice than their counterparts. Results of this analysis are in agreement with Cooley and Lohnes (1968) when they state that ". . . there is a unique and discriminable centroid (profile of means) for each career pattern in a suitable personality measurement space."

Conclusions concerning which ninth grade variables simultaneously differentiate among successful and unsuccessful vocational and academic students are as follows:

1. Examination of the classification data and group centroids indicates that group belongingness described in terms of successful and unsuccessful membership using the student characteristics employed in this study is possible, as well as being reasonable and useful.
2. Of the 16 independent variables used in this study, 14 variables differentiate among the four groups, and six of

these variables appear to possess most of the unique discriminating information.

3. Of the 16 student characteristic variables included in this study the GATB aptitudes Verbal and Numerical, the value Prestige, the construct of Vocational Maturity and the socioeconomic variables Father's Education and level of Occupational Aspiration appear to contain most of the discriminating information necessary to distinguish among successful and unsuccessful vocational and academic students.
4. Using the student characteristics employed in this study unsuccessful academic students were found to resemble either successful or unsuccessful vocational students more closely than they resembled successful academic students. This finding has direct implications for vocational guidance as well as for vocational education.

Implications

Super's Theory

Using the eleven propositions set down by Super (1957) as representative of his theory, six of the propositions appear to be directly substantiated by this study while none can be refuted as a result of the study's findings. Concerning the vocational development process, it does appear to be somewhat predictable, patterned and orderly. Also, the basic need for compromise is illustrated when the amount of unsuccessful or poorly matched curriculum decisions are

considered. The part played by reality factors in the vocational development process can be seen from such examples as vocational students' being less concerned about prestige and aspiring to lower level occupations than academic students. However, since the students in this study were still in the latter growth stage (capacity) or the early exploration stage (tentative) a somewhat unrealistic perception of the relationship between their characteristics and their vocational choices and successes could be expected and indeed was found. The large amount of influence brought to bear on the vocational development process by parents and family background can be seen in this study as Father's Education and level of Occupational Aspiration were consistently related to choice and success. The potential relationship between vertical movement among occupational <u>levels</u> and various characteristics can also be appreciated from the results of this study. However, the relationship between an individual's characteristics and <u>fields</u> of occupation is not possible to speculate on from the study. Finally, the fact that any occupation and career can accommodate a wide range of characteristics was once again demonstrated with the large amount of characteristics found not to be uniquely related to choice or success.

Other aspects of Super's theory as it has evolved over the years are also substantiated by this study. The validity of the Vocational Maturity construct, although it may be inadequately represented by the VDI, is supported here. Also, the overall concept of stages of vocational development as a framework in which to conduct research and organize our finds appears very agreeable to this study. Perhaps the

greatest contribution this study can make to Super's theory is in its demonstration that, as Cooley and Lohnes (1968) have shown, a large amount of student characteristic data can be longitudinally organized and used to increase our knowledge of the vocational development process.

Cooley and Lohnes

The basic premise of the Cooley and Lohnes (1968) "Career Development Tree" is that the points in time chosen by them to reflect career decisions are valid and useful because decisions made at these times are relatively stable and can be reliably predicted by antecedent student characteristic variables. The results of this study serve to strengthen the argument for use of the end of ninth grade as a critical decision point in studying career paths. The use of variables other than the MAP factors used by Cooley and Lohnes point out the generalizability of their findings. The additional information uncovered in this study which may have implications for the Cooley and Lohnes' model is that successful and unsuccessful group membership can be even more reliably predicted than the initial group membership. This finding suggests that the addition of success and perhaps satisfaction to the original Cooley and Lohnes' model would strengthen the model and perhaps account for much of the "path-jumping"or "migrating." Success could be added directly to the career tree by dividing each group on this basis which would result in two distinct branches at every point in time. This would, of course, make the model more difficult to handle and with the inclusion of satisfaction the tree may begin to

grow out of control. Another approach would be to construct separate trees for each type of group (e.g., a successful tree or a satisfied tree). A third possibility is to use the success and satisfaction information only when examining the movement from one point in time to a second point in time in order to ascertain the effects of each on that particular decision or stage of development. Many other approaches for the use of this information are possible.

Also demonstrated in this study was the use of MRA in conjunction with MDFA in order to gain all of the information in a continuous dependent variable which is sacrificed when that variable is dichotomized for use in MDFA. Tatsuoka (1957) has previously shown how these two methodologies can be combined to arrive at a joint probability. The emphasis in this study, however, has been on providing more information about group membership through the use of a success variable at a second point in time.

Recommendations

This investigation has provided some answers to a number of specific questions in addition to uncovering several other findings of interest to vocational development researchers and educators alike. Based on the findings of this research a number of likely topics for further study recommend themselves and are listed here.

1. First of all, it is recommended that a study similar to this study be replicated with another group of ninth grade boys in another school and community setting. Only in this

way will the reliability and generalizability as well as the validity of this research be ascertained.

2. A design similar to this study but with the use of other variables, especially from the affective domain, should be undertaken with the hope of uncovering additional unique information which is predictive of curriculum choice as well as success and satisfaction in that choice.
3. An extension of this study to include a satisfaction variable used in this study should be explored. This could be accomplished by either substituting a satisfaction variable for the success variable or by making an additional dichotomy on the basis of satisfaction. The satisfaction data could be gathered at a third point in time such as the end of eleventh or twelfth grade.
4. The relationship between students' ninth grade characteristics and group membership including success and satisfaction in high school and after high school should be studied using at least four points in time. Possible time intervals to include are: Ninth grade, during high school, one year after high school and five years after high school.
5. The study of the application of this information to improving our educational system through better vocational guidance and curriculum reorganization should be undertaken simultaneously with the research itself in order to bridge the gap between research and implementation.

REFERENCES

Asbury, Frank A. "Vocational Development of Rural Disadvantaged Eighth Grade Boys." Vocational Guidance Quarterly, 1968, pp. 109-113.

Ashby, Jefferson D., Wall, Harvey W., and Osipow, Samuel H. "Vocational Certainty and Indecision in College Freshman." Personnel and Guidance Journal, 1966, 44, 1037-1041.

Astin, Helen S. "Career Development During the High School Years." Journal of Counseling Psychology, 1967, 14, 94-98.

Bachman, Jerald G. Youth in Transition: The Impact of Family Background and Intelligence on Tenth Grade Boys. Ann Arbor: Institute for Social Research, University of Michigan, 1970.

Baer, Max F., and Roeber, Edward C. Occupational Information: The Dynamics of Its Nature and Use. Chicago: Science Research Associates, Inc., 1964.

Bathory, M. J. "Occupational Aspirations and Vocational Maturity." Paper presented at the Conference of the American Vocational Association, Cleveland, December, 1967.

Beck, Carleton E., and Barak, James. "The Place of Values in the Study of Society." School and Society, February, 1967, pp. 122-123.

Blau, Peter M. and Duncan, Otis D. The American Occupational Structure. New York: John Wiley and Sons, Inc., 1967.

Buhler, Charlotte. Der meuschliche Lebenslauf als psychologisches Problem. Leipzig: Heizel, 1933.

Clark, E. T. "Influence of Sex and Social Class on Occupational Preference and Perception." Personnel and Guidance Journal, 45, 1967, pp. 440-444.

Cooley, William W., and Lohnes, Paul R. Predicting Development of Young Adults. (Interim report 5 to the U. S. Office of Education, Cooperative Research Project No. 3051) Palo Alto: Project TALENT Office, American Institutes for Research and University of Pittsburgh, 1968.

Crites, John O. "A Model for the Measurement of Vocational Maturity." Journal of Counseling Psychology, 1961, 8, 255-259.

Crites, John O. "The Measurement of Vocational Maturity in Adolescence: I. The Attitude Test of the Vocational Development Inventory." Psychological Monographs, American Psychological Association, 1965.

Crites, John O. The Maturity of Vocational Attitudes in Adolescence. Iowa City, Iowa: University of Iowa, 1969.

Crites, John O., and Samler, I. J. "Adjustment, Educational Achievement and Vocational Maturity as Dimensions of Development in Adolescence." Journal of Counseling Psychology, 1967, 14, 489-496.

Dipboye, W. J., and Anderson, W. F. "The Ordering of Occupational Values by High School Freshman and Seniors." Personnel and Guidance Journal, 1959, 121-124.

Droege, Robert C. "Validity Extension Data on the General Aptitude Test Battery." Vocational Guidance Quarterly, 1965, 56-58.

Droege, Robert C. "GATB Longitudinal Maturation Study." Personnel and Guidance Journal, 1966, 919-930.

Dutt, Karl. "Report of Preliminary Results on Vocational Readiness of Eighth and Ninth Grade Vocational-Technical Students." Easton, Pennsylvania, 1968. (Unpublished manuscript)

Dvorak, Beatrice J. "The General Aptitude Test Battery." Personnel and Guidance Journal, 1956, 145-155.

Fisher, R. A. "The Use of Multiple Measurements in Taxonomic Problems." Annals of Eugenics, 7, 1936, 179-188.

Flanagan, J. C., Darley, J. F., Shaycoft, M. F., Gorham, W. A., Orr, D. B., Goldberg, I. Design for a Study of American Youth. Boston: Houghton Mifflin, 1962.

Flanagan, J. C., Cooley, W. W., Lohnes, P. R., Schoenfeldt, L. F., Holderman, R. W., Combs, J., and Becker, S. Project TALENT One-Year Follow-up Studies. Pittsburgh: Project Talent Office, University of Pittsburgh, 1966.

Ginzberg, E., Ginsberg, S. W., Axelrad, S., and Herma, J. L. Occupational Choice: An Approach to a General Theory. New York: Columbia University Press, 1951.

Ginzberg, Eli. "Toward a Theory of Occupational Choice." Personnel and Guidance Journal, 1952, 30, 491-494.

Gribbons, Warren D., and Lohnes, Paul R. "Shifts in Adolescent Vocational Values." Personnel and Guidance Journal, 1965, 44, 248-257.

Gribbons, Warren D., and Lohnes, Paul R. "A Five Year Study of Students' Educational Aspirations." Vocational Guidance Quarterly, 1966, 15, 66-70.

Gribbons, Warren D., and Lohnes, Paul R. Emerging Careers. New York: Teachers College Press, Columbia University, 1968.

Hallberg, M. C. Statistical Analysis of Single Equation Stochastic Models Using the Digital Computer. University Park, Pennsylvania: The Pennsylvania State University, Department of Agricultural Economics and Rural Sociology, Monograph 78, February, 1969 (revised February, 1970).

Hallberg, M. C. Multiple Discriminant Analysis for Studying Group Membership. University Park, Pennsylvania: Pennsylvania State University, College of Agriculture, Agriculture Experiment Station, Bulletin 775, February, 1971.

Holland, John L. "A Theory of Vocational Choice." Journal of Counseling Psychology, 1959, 6, 35-45.

Holland, John L. The Psychology of Vocational Choice. Waltham, Mass.: Blaisdell, 1966.

Hollingshead, A. B. Elmstown's Youth: The Impact of Social Classes on Adolescents. New York: John Wiley and Sons, Inc., 1949.

Holloway, L. D. "An In-Depth Study of the Cooperative Vocational Education Program, Champaign Central High School, Champaign, Illinois." University of Illinois, 1967. (unpublished manuscript.)

Hu, Teh-Wei, Lee, Maw Lin, and Stromsdorfer, Ernst W. "Economic Returns to Vocational and Comprehensive High School Graduates." Journal of Human Resources, 1971, 6, 25-50.

Impellitteri, Joseph T., and Kapes, Jerome T. "Using the GATB with Vocational or Technical Bound Ninth Grade Boys." Vocational Guidance Quarterly, 1969, 18, 59-64.

Impellitteri, Joseph T., Kapes, Jerome T., Sievert, Norman W., and Wiersteiner, S. Richard. "Factors Related to the Occupational Values and Vocational Maturity of a Selected Sample of Ninth Graders." Paper presented at the American Vocational Association, Boston, December, 1969.

Impellitteri, Joseph T., and Kapes, Jerome T. "The Measurement of Occupational Values." University Park, Pennsylvania: Department of Vocational Education, Pennsylvania State University, 1970. (prepublication draft.)

Ingersoll, R. W., and Peters, H. J. "Predictive Indices of the GATB." Personnel and Guidance Journal, 1966, 931-937.

Jordan, Jean P. "Exploratory Behavior: The Formation of Self and Occupational Concepts." (In Career Development: Self-Concept Theory. New York: College Entrance Exam Board, 1963, 42-95).

Katz, Martin. Decisions and Values: A Rationale for Secondary School Guidance. New York: College Entrance Examination Board, 1963.

Kapes, Jerome T. Exploring the Use of the GATB with Vocational-Technical Bound Ninth Grade Boys. University Park, Pennsylvania: Department of Vocational Education, Pennsylvania State University, January, 1969, Research Series Number 3.

Kapes, Jerome T. "Exploring the Use of the GATB with Ninth Grade Boys." Paper presented at American Personnel and Guidance Association, Las Vegas, March, 1969.

Kapes, Jerome T. "The Occupational Values of Ninth Graders who Select a Vocational vs. a Non-Vocational Curriculum in High School." (Unpublished paper, December, 1969.)

Kaufman, Jacob J., Stromsdorfer, Ernst W., Hu, Teh-Wei, and Lee, Mou Lin. An Analysis of the Comparative Costs and Benefits of Vocational Versus Academic Education in Secondary Schools. University Park, Penna.: Institute for Research on Human Resources, The Pennsylvania State University, October, 1967.

Kinnane, J. F., and Pable, M. W. "Family Background and Work Value Orientation." Journal of Counseling Psychology, 1962, 9, 320-325.

Krippner, S. "Junior High School Students' Vocational Preferences and Their Parents' Occupational Level." Personnel and Guidance Journal, 41, 1963, 590-595.

Li, Jerome C. R. Statistical Inference: II. Ann Arbor: Edwards Brothers, Inc., 1967.

Lohnes, Paul R. Measuring Adolescent Personality (Interim report 1 to the U. S. Office of Education, Cooperative Research Project No. 3051) Pittsburgh: Project Talent Office, University of Pittsburgh, 1966.

Miller, D. C., and Form, W. H. Industrial Sociology. New York: Harper, 1951.

Miller, I. W., and Haller, A. O. "A Measure of Level of Occupational Aspiration." Personnel and Guidance Journal, 1964, 42, 448-455.

Montesano, Nicholas, and Geist, Harold. "Differences in Occupational Choice Between Ninth and Twelfth Grade Boys." Personnel and Guidance Journal, 1963, 43, 150-158.

Moss, Jerome, Jr. The Evaluation of Occupational Education Programs. Minneapolis, Minnesota: Research Coordination Unit in Occupational Education, University of Minnesota, Technical Report, September, 1968.

Osipow, Samuel H. "Perceptions of Occupations as a Function of Titles and Descriptions," Journal of Counseling Psychology, 1962, 9, 106-109.

Osipow, Samuel H. Theories of Career Development. New York: Appleton-Century-Crofts, 1968.

Osipow, Samuel H., Ashby, Jefferson D., and Wall, Harvey W. "Personality Types and Vocational Choice: A Test of Holland's Theory." Personnel and Guidance Journal, 1966, 45, 37-42.

Parsons, Frank. Choosing A Vocation. Boston: Houghton Mifflin, 1909.

Pickett, L. M. "The General Aptitude Test Battery as a Predictor of College Success." Utah State University, 1958. (Unpublished master's thesis.)

Prediger, Dale J., Waple, Charles C., and Nusbaum, Gerald R. "Predictors of Success in High School Level Vocational Education Programs: A Review, 1954-1967." Personnel and Guidance Journal, 1968, 47, 137-145.

Prediger, Dale J. Validation of Counseling-Selection Data for Vocational School Students. (Final report U. S. Office of Education, Project No. 5-1169.) Toledo, Ohio: University of Toledo, June, 1970.

Pucel, David J., Nelson, Howard F., and Wheeler, David N. Differentiating Among Graduates of Vocational-Technical Curriculums. (Project MINI-SCORE) Minneapolis: University of Minnesota, Department of Industrial Education, July, 1970.

Pucel, David J., Nelson, Howard F., Heitzman, Darrell, and Wheeler, David N. "Vocational Maturity and Vocational Training." Paper presented at the American Vocational Association, New Orleans, 1970.

Rand McNally and Company. Standard Preference Map and Guide of Pennsylvania. New York: Rand McNally and Company, 1969.

Reiss, Albert J., Jr. Occupations and Social Status. New York: The Free Press of Glencoe, Inc., 1961.

Roe, Ann. Psychology of Occupations. New York: John Wiley and Sons, Inc., 1956.

Roe, Ann, and Siegelman, Marvin. The Origin of Interests. Washington: American Personnel and Guidance Association, APGA Inquiry Studies, Number One, 1964.

Rulon, Paul J. "Distinction Between Discriminant and Regression Analysis and a Geometric Interpretation of the Discriminant Function." Harvard Educational Review, 1951, 21, 80-90.

Rulon, Phillip J., Tiedeman, David V., Tatsuoka, Maurice M., and Langmuir, Charles R. Multivariate Statistics for Personnel Classification. New York: John Wiley and Sons, Inc., 1967.

Samuelson, C. E. "The General Aptitude Test Battery in Predicting Success of Vocational School Students." Journal of Educational Research, 1956, 50-3, 175-182.

Shartle, Carroll L. Occupational Information: Its Development and Application. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1959.

Singer, Stanley L., and Stefflre, Bufford. "The Relationship of Job Values and Desires to Vocational Aspirations of Adolescents." Journal of Applied Psychology, 1954, 38, 419-422.

Sonquist, John A. Multivariate Model Building: The Validation of a Search Strategy. Ann Arbor: Institute for Social Research, University of Michigan, 1970.

Sprinthall, Norman A. "Work Values and Academic Achievement." Vocational Guidance Quarterly, 1966, 52-55.

Stefflre, Bufford. "Concurrent Validity of the Vocational Values Inventory." Journal of Educational Research, 1959, 52, 339-341.

Super, Donald E. "A Theory of Vocational Development." American Psychologist, 1953, 8, 185-190.

Super, Donald E. The Psychology of Careers. New York: Harper, 1957.

Super, Donald E. "Some Unresolved Issues in Vocational Development Research." Personnel and Guidance Journal, 1961, 40, 11-25.

Super, Donald E. "The Structure of Work Values in Relation to Status, Achievement, Interests, and Adjustments." Journal of Applied Psychology, 1962, 46, 231-239.

Super, Donald E. "The Definition and Measurement of Early Career Behavior: A First Formulation." Personnel and Guidance Journal, 1963, 41, 775-770.

Super, Donald E. "Vocational Development Theory: Persons, Positions, and Processes." The Counseling Psychologist, 1969, 1, no. 1.

Super, Donald E. "Vocational Development Theory in 1988: How Will It Come About?" The Counseling Psychologist, 1969, 1, no. 1.

Super, Donald E., Crites, J. O., Hummel, R. D., Moser, Helen P., Overstreet, Phoebe L., and Warnath, C. F. Vocational Development: A Framework for Research. New York: Bureau of Publications, Teachers College, Columbia University, 1957.

Super, Donald E., and Crites, John O. Appraising Vocational Fitness. New York: Harper and Row, 1962, (second edition).

Super, Donald E., and Overstreet, Phoebe L. The Vocational Maturity of Ninth Grade Boys. New York: Bureau of Publications, Teachers College, Columbia University, 1960.

Super, D. E., Starishevsky, R., Matlin, N., and Jordaan, J. P. Career Development: Self-Concept Theory. New York: College Entrance Examination Board, 1963.

Tatsuoka, M. M. Joint Probability of Membership and Success in a Group: An Index which Combines Analysis as Applied to the Guidance Problem. Cambridge: Harvard Studies in Career Development, Number 6, 1957.

Thomas, Lawrence G. The Occupational Structure and Education. Englewood Cliffs, N. J.: Prentice-Hall, Inc., 1956.

Thompson, O. E. "Occupational Values in High School Students." Personnel and Guidance Journal, 1966, 44, 850-853.

Thorndike, Robert L., and Hagen, Elizabeth. 10,000 Careers. New York: Wiley, 1959.

Tiedeman, David V. "The Utility of the Discriminant Function in Psychological and Guidance Investigations." Harvard Educational Review, 1951, 21, 71-80.

Tiedeman, David V. "Decision and Vocational Development: A Paradigm and its Implications." Personnel and Guidance Journal, 1961, 40, 15-20.

Tiedeman, David V., and O'Hara, Robert P. Career Development: Choice and Adjustment. New York: College Entrance Examination Board, 1963.

United States Department of Labor. Dictionary of Occupational Titles: Volume II. Washington: U. S. Government Printing Office, 1965, (3rd Edition).

United States Department of Labor. Manual for the General Aptitude Test Battery, Section III: Development. Washington, D. C., the Department, 1967.

Veldman, Donald J. Fortran Programming for the Behavioral Sciences. New York: Holt, Rinehart and Winston, 1967.

Walbert, Herbert J. "Generalized Regression Models in Educational Research." American Educational Research Journal, 1971, 8, 71-92.

Wall, Harvey W., Osipow, Samuel H., and Ashby, Jefferson D. "SVIB Scores, Occupational Choices and Holland's Personality Types." Vocational Guidance Quarterly, 1967, 15, 201-205.

Warner, W. Lloyd, Meeker, Margaret, and Eels, K. Social Class in America. Chicago: Science Research Associates, 1949.

Weinberg, Carl and Skager, Rodney. "Social Status and Guidance Involvement." Personnel and Guidance Journal, 44, 1966, 586-590.

Weiss, David J., Dawis, Rene U., Lofquist, Lloyd H., Tinsley, Howard E. A., and Waruken, Robert G. "A Follow-Up Survey of Former Clients of the Minnesota Division of Vocational Rehabilitation." Minnesota Studies in Vocational Rehabilitation: XXVI, 1969.

Whitney, Douglas R. "Predicting from Expressed Vocational Choice: A Review." Personnel and Guidance Journal, 1969, 48, pp. 279-286.

Wrenn, C. Gilbert. "Human Values and Work in American Life." Man in a World at Work. (Edited by Henry Borow). Boston: Houghton Mifflin Co., 1964, 24-44.

Zytowski, Donald G. "The Concept of Work Values." Vocational Guidance Quarterly, 1970, 18, 176-186.